NetWare® Connection

THE MAGAZINE FOR NOVELL® NETWORKING PROFESSIONALS

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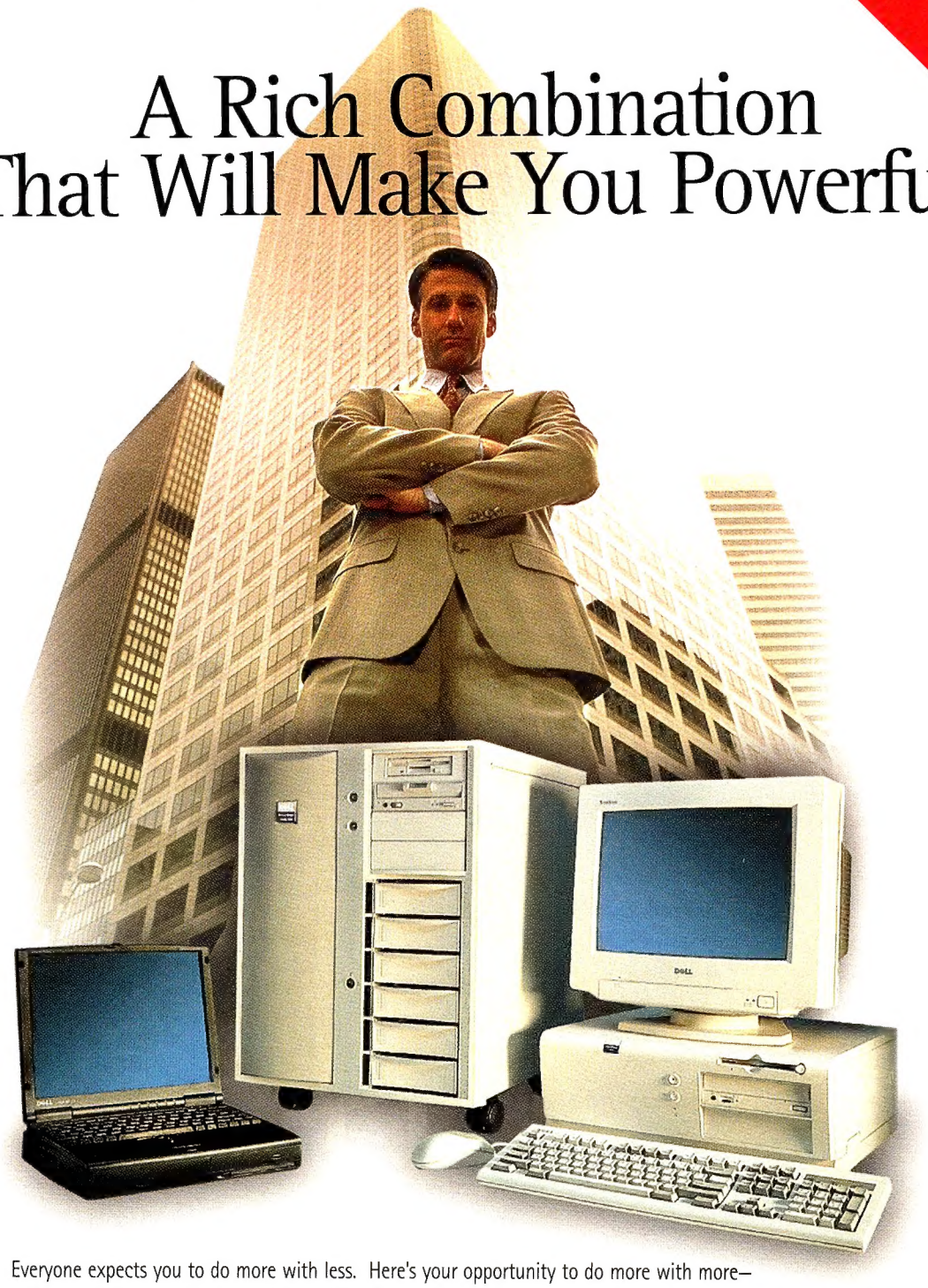

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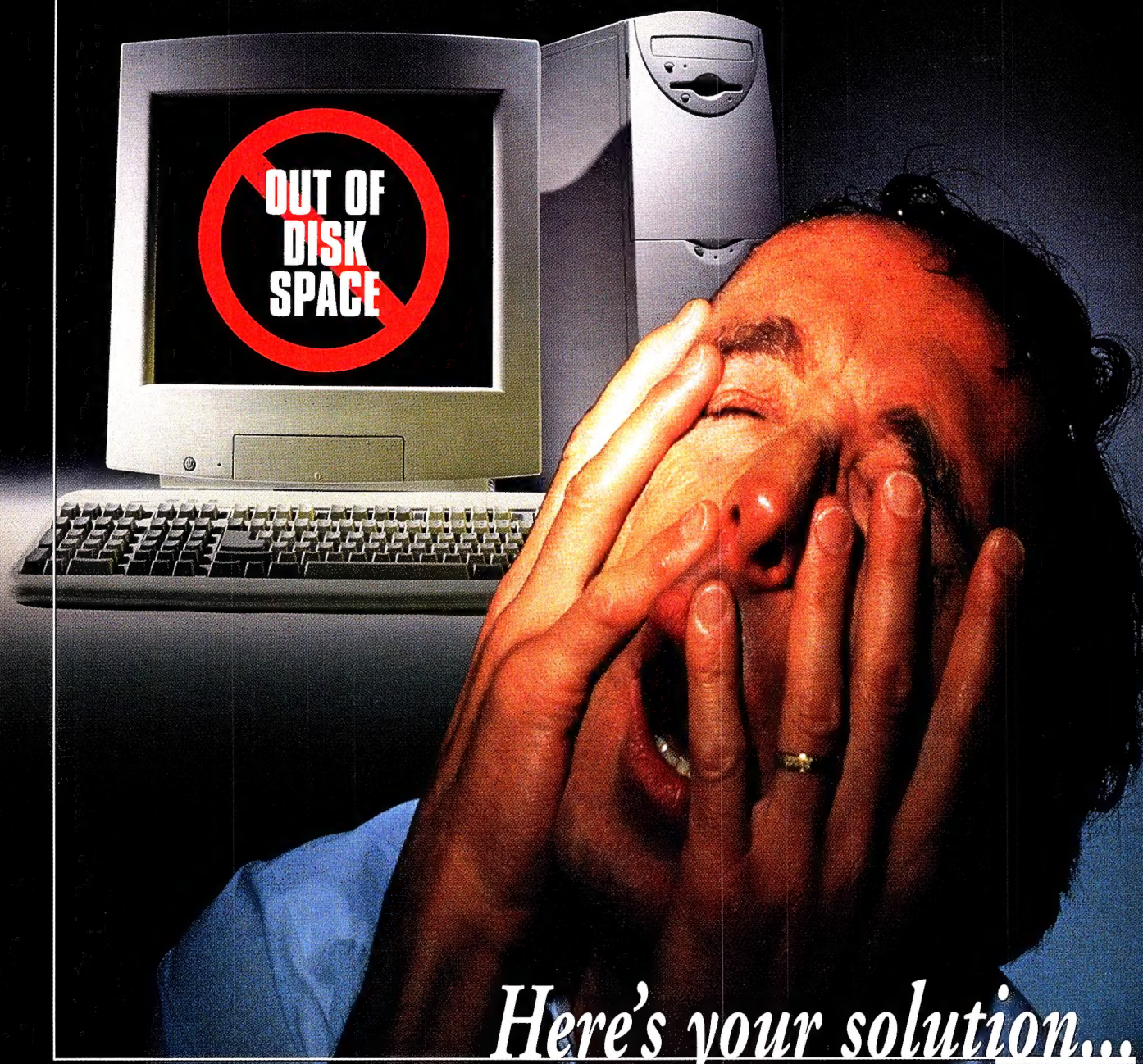

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NETWARE® CONNECTION

July 1998

The Magazine for Novell® Networking Professionals

COVER STORY page 8

Novell's Open Solutions Architecture is focused on lowering companies' cost of ownership.

FEATURE

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NOVELL'S DEVELOPERNET WEB SITE

Whether you are currently developing products that run on NetWare or are considering becoming a NetWare developer, you should visit Novell's DeveloperNet World-Wide Web site. (If you aren't already developing products that run on NetWare, the article on p. 8 might just convince you to start.) This web site is a great resource for developers. For example, you can download free developer tools and view developer publications, such as *Novell Application Notes* and *Novell Developer Notes*.

To access the DeveloperNet web site, visit the *NetWare Connection* home page, and click the Novell's DeveloperNet Web Site button. Then see for yourself how Novell supports developers!

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Contributors

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John Roberts

NetWare Connection, July issue, Volume 9, Number 6

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BPA INTERNATIONAL

LETTERS TO THE EDITOR

Bug Off!

Your recent article about the year 2000 problem is exceptional ("Exterminating the Millennium Bug Before It Wreaks Havoc on Your Company's Network," *NetWare Connection*, June 1998, pp. 8–20)! I work for the U.S. Army Corps of Engineers, and we are now using some of Linda Boyer's suggestions to help complete our conversion for the year 2000. In fact, we would love to use the millennium bug graphic on the cover of the June 1998 issue as a mascot for our year 2000 efforts. Can I get a copy of this graphic in an electronic format?

Ron Andersen

We have been deluged with requests from readers who want to use the millennium bug graphic. Although we are thrilled that this graphic is so popular, we cannot freely distribute the graphic. Unfortunately, we purchased only one-time usage rights from the artist, Bill Mayer, so even we cannot use the graphic again (which is too bad because it's one of our favorites).

Kimberly Brinkerhoff-Jones, editor

DOS Partitions for NetWare 5

When I recently tried to upgrade from NetWare 4.1 to NetWare 4.11, I noticed that the upgrade process required more available hard drive space on the DOS partition than I already had. Unfortunately, I do not know how to increase the size of the DOS partition, so I could not continue with the upgrade process.

Now after reading the article "NetWare 5 Knows No Limits," I am interested in upgrading to NetWare 5 instead (*NetWare Connection*, May 1998, pp. 6–21). Before I do, I would like to ask several questions:

- What size DOS partition does the installation process require?
- Is there a product I can use to decrease the size of the NetWare partition and increase the size of the DOS partition?
- Can I perform the installation process from a JAZ drive?

Raymond Jacob

As we go to press, NetWare 5 has not been released yet, so I cannot answer these questions specifically with regard to NetWare 5. However, NetWare 5 should simplify the process of creating DOS partitions. (Sometime after NetWare 5 is released, NetWare Connection *will include an article about how NetWare 5 handles DOS partitions.)*

In the meantime, I can give you some general guidelines that should apply to NetWare 5 and NetWare 4:

- *I recommend that the DOS partition be a size equal to twice the amount of RAM in the server. For example, if you had installed 128 MB of RAM, you would create a DOS partition that is 256 MB in size. A DOS partition this large can hold NetWare startup files, patches, drivers, and so on. You also have room to do a RAM dump to the hard drive in the event of a server ABEND. In addition, you have room to zip the dump file for analysis if necessary.*

  If you do not want to increase the size of the DOS partition, you can install an IDE hard drive that is the same size as the recommended size of the DOS partition. You can then use this hard drive to hold only the DOS partition.
- *PowerQuest Corp., the company that makes PartitionMagic, is planning to release a product that allows you to dynamically change the size of the NetWare partition. This product should be available soon. (For more information about the product, visit PowerQuest's World-Wide Web site at http://www.powerquest.com. You can also call 1-800-379-2566 or 1-801-437-8900.)*
- *If you copy all of the appropriate files from the installation CD-ROM to the JAZ drive, you can perform the installation process from this drive. In fact, you can perform the installation process from any DOS-accessible drive. You just have to remember that the drive is a DOS device, not necessarily a mountable volume.*

  Before you begin the installation process, you should ensure that you have all of the necessary updates to the hardware, firmware, and software on the server, including NetWare Loadable Module (NLM) and driver updates. You should also make several backups before you begin the installation process.

Mickey Applebaum, NetWare Connection *columnist*

Circulation

NetWare Connection is distributed to more than 140,000 intraNetWare and NetWare users worldwide.

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NetWare User Groups. You can find out how to join a NetWare user group at http://www.novell.com/nui/groups. You can also call 1-800-228-4684 or 1-801-228-4500 or send a fax to 1-801-228-4577.

Article Proposals. We accept articles from intraNetWare and NetWare users. Please send a proposed outline via e-mail to dpearson@novell.com, or mail the outline to Debi Pearson, *NetWare Connection*, P.O. Box 19007, Provo, UT 84605-9007.

NetWare Users International

Outsource the Management of Your GroupWise Gateways

▶ DAYTON, OH—Novell's GroupWise 5.2 advanced gateways allow experienced GroupWise administrators to offer their users features like web and telephone access to their e-mail as well as the ability to send and receive faxes and pages directly from the GroupWise client. Although many of these gateways have been available for years, cost, installation, maintenance, and hardware have prevented many GroupWise administrators from taking advantage of these features.

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▶ **Web Access.** With an IP link between Allegro's GroupWise Web Access gateway and your GroupWise POA, all your users can easily access their corporate GroupWise mailbox from any web browser—without using the remote client and the Async gateway dial-up.

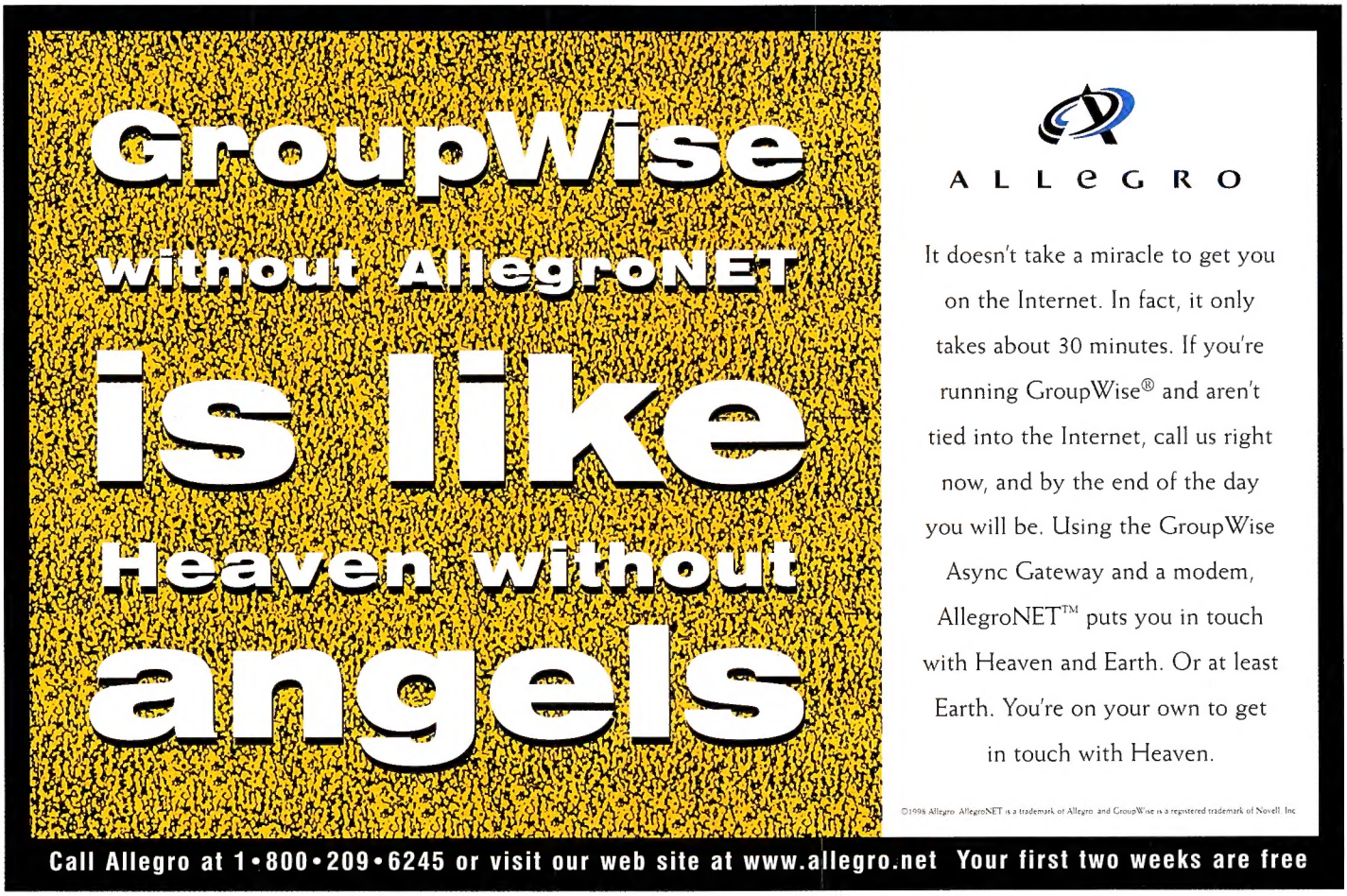
▶ **Outbound Fax.** An IP connection between Allegro's GroupWise Fax gateway and your GroupWise MTA is all that's needed for your users to send faxes directly through their GroupWise desktop. Users simply type fax:{fax number} in the "To" line of their e-mail screen, attach the document to a GroupWise message and press the Send button. Allegro delivers the fax and returns a status message to the sender.

▶ **Inbound Fax.** A dedicated fax number or DID is established for each company at Allegro's site. When Allegro receives a fax at this number, it is immediately attached to a GroupWise message and routed via IP to the recipient's GroupWise mailbox.

▶ **Pager.** The Pager gateway enables messages to be sent to a user's alphanumeric pager. Important messages can be automatically forwarded to a pager using rules. Users can also send pages without knowing a long pager PIN number. Simply typing pager: {GroupWise User ID} in the "To" field sends the message to the user's pager instantly. The setup is just like the other gateways—an IP connection between the MTA and Pager gateway.

▶ **TAS.** The Telephone Access Server (TAS) allows GroupWise users to listen to their messages via a telephone, pay phone, or cell phone. Users simply call Allegro's TAS gateway, and the system tells them the number of unread messages, reads the subject line(s), and tells how long it will take to read the body of each message and any attachments. Users can forward the message to a fax machine or another user. Or users can generate an immediate reply: the TAS creates a .WAV file attached to the reply message. As with the other gateways, these features are available with an IP connection between Allegro and the POA of the users' post office.

▶ GroupWise system administrators can begin offering the features of these gateways within just a few hours of contacting Allegro. All you need is an IP connection to the Internet or an Async gateway. For additional information on how you can start taking advantage of the exciting functionality of these gateways—without having to worry about any of the maintenance—contact Allegro today at (800) 209-6245. Or visit their web site at http://www.allegro.net.



Using the BINDFIX Utility

Thank you for your recent article about designing a Novell Directory Services (NDS) tree ("Designing Your Company's NDS Tree," *NetWare Connection*, May 1998, pp. 34–35). I just have one question: Can you reduce the number of orphaned bindery objects if you run Novell's BINDFIX utility prior to migrating users and network resources from a NetWare 3 server to the NDS tree?

Shawn Downs

Although you can reduce the number of orphaned bindery objects by running the BINDFIX utility, you cannot completely eliminate them with this utility. As a result, you may inadvertently migrate orphaned bindery objects from the NetWare 3 server to the NDS tree, which can cause problems. For example, orphaned bindery objects cannot be managed or deleted from the NDS tree. The only way to ensure that you do not migrate orphaned bindery objects is to manually edit the bindery to remove these objects.

Mickey Applebaum, NetWare Connection *columnist*

Using the BorderManager Proxy Cache

I just read the article "Ensuring That All Web Traffic Uses BorderManager Proxy Cache" by Terry L Jeffress (*NetWare Connection*, May 1998, pp. 42–43). In this article, Terry explains how you can create a packet filter to block all web traffic from getting to the Internet. Terry then explains how you can create an exception to this packet filter that enables the BorderManager proxy cache to send web traffic to the Internet.

I see a potential problem with the exception to the packet filter that Terry describes: Suppose that a user were using an IPX-IP gateway instead of a TCP/IP stack, and further suppose that the IPX-IP gateway were located on the same server as the BorderManager proxy cache. In this case, the exception to the packet filter would allow the user to bypass the BorderManager proxy cache because the user's outbound packets would have the same IP address as the BorderManager proxy cache has.

Bruce Dare

I believe you can implement a solution that targets the specific port used by the IPX-IP gateway. First, you must find the port number. You must then create a packet filter that blocks all web traffic from that port with an outbound destination port of 80. Finally, you must create an exception to the packet filter that allows the port used by the IPX-IP gateway to communicate through port 80 on the server. (Unfortunately, my test server is not currently running the IPX-IP gateway, and I cannot test this solution.)

If the server contains multiple network interface boards, you can also try another solution: You can assign the BorderManager proxy cache to the first network interface board's IP address, and you can assign the IPX-IP gateway to the second network interface board's IP address. You can then configure the packet filter and the exception to this packet filter to control communication between the two network interface boards.

Terry L Jeffress, author

Using the BANJO NLM

The April 1998 issue of *NetWare Connection* includes an article about creating an NDS tree with one million User objects ("One Million User Objects: NDS Meets the Challenge, pp. 38–40). This article mentions an NLM for creating User objects directly on the server. Can I get a copy of this NLM? I do a lot of internal training at my company, and I could use the NLM to create a test environment for my students.

Chris Conway

You can download the NLM, which is called BANJO.NLM, from NetWare Connection's *web site (http://www.novell.com/nwc). You can use this NLM to create an NDS tree with three levels of container objects on a NetWare 5 or NetWare 4.11 server. The number 3 is hard coded in the NLM; as a result, you cannot create a different number of levels. If you specified that you wanted 10 container objects in every level, the NLM would create an NDS tree with three levels of 10 container objects, for a total of 30 container objects.*

You can then use the NLM to create any number of User objects per container object. Again, this NLM organizes the User objects within each container object into three levels.

Before you download the NLM, you should be aware that this NLM is not supported by Novell. If you experience problems with the NLM, you're on your own!

JD Marymee, author

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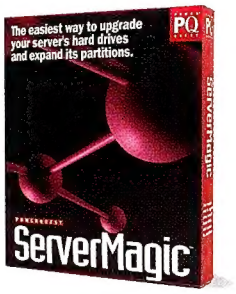

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Open Solutions Architecture

Novell's Open, Internet-Based Development Strategy

Terry L Jeffress

In the past, companies measured the success of their network by the amount of data the network could carry. Today, however, companies must also consider network management because the costs associated with managing desktops, applications, and the network itself are increasing. (See "One Vision, One Strategy, and One Architecture" at http://www.novell.com/osa/briefing.html.)

Network management becomes even more important as companies struggle with the opportunity and the complexity of the Internet. In the expanding role of the Internet, the number one concern of most network administrators is managing all of the services and devices that are connected to the network.

Providing solutions that enable network administrators to manage their networks and reduce the total cost of ownership is fundamental to Novell's Open Solutions Architecture (OSA). OSA is Novell's strategy to make it easier to develop solutions for the NetWare platform. OSA focuses on Internet standards and open Application Program Interfaces (APIs) to provide network administrators and developers with more flexibility in building solutions that are network aware, Internet ready, and manageable.

This article explains Novell's OSA strategy and the developer tools that support this strategy.

EVOLVING THE NETWARE PLATFORM

With OSA, NetWare will no longer be a proprietary platform for application development. The purpose of OSA is to make the NetWare platform more useful, open, and easier for developers to build network solutions. The open APIs allow developers to

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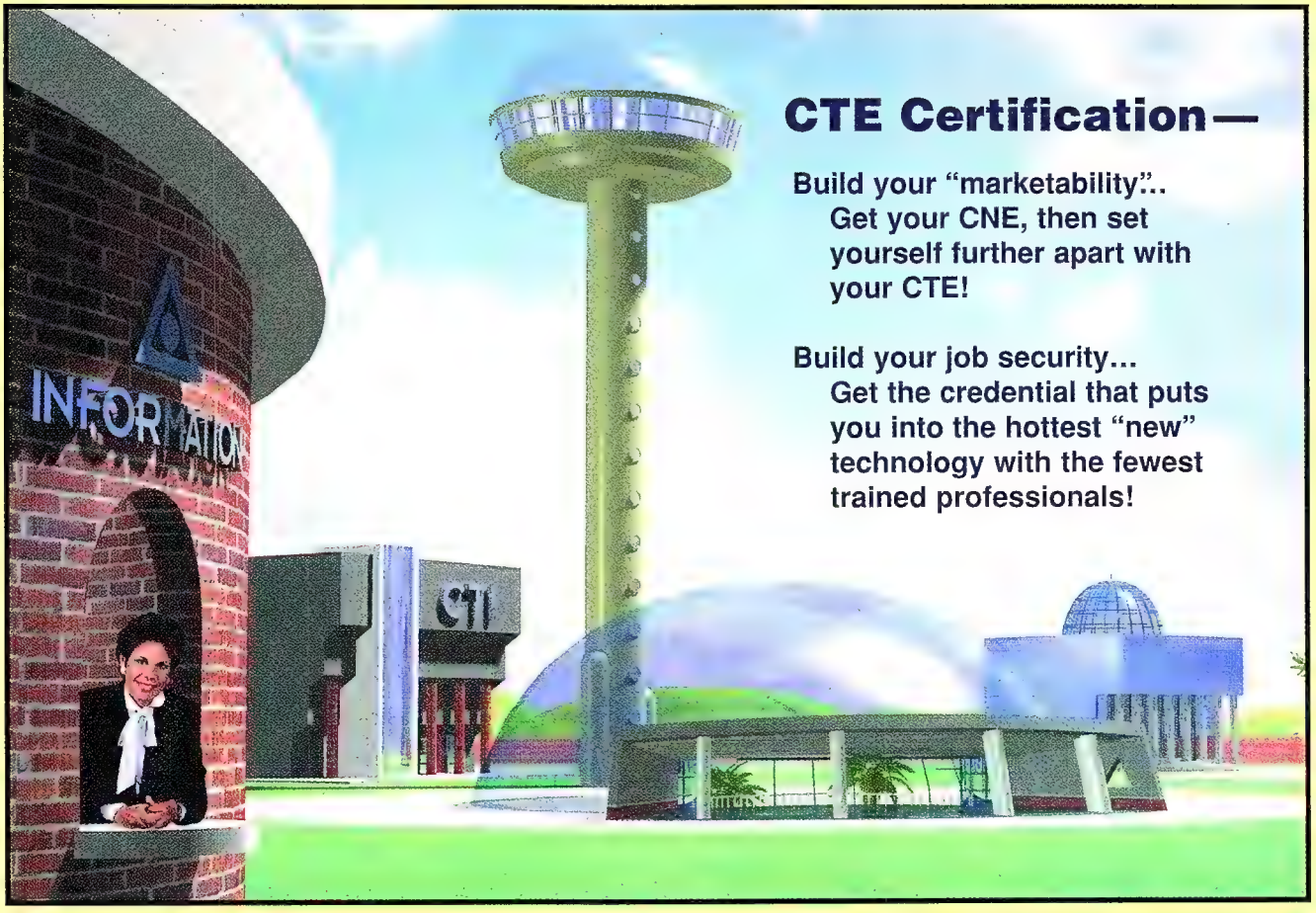

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easily access Novell's advanced network, Internet, and management services, whether these developers use C/C++ APIs, Java class libraries and JavaBeans, or scripting languages (such as Visual Basic, JavaScripts, and Perl).

OSA is not only focused on the creation of network-aware applications but also addresses application deployment and management issues. Novell's goal is to evolve NetWare to become the best platform for deploying open solutions that are easily integrated with directory and management services. Through OSA Novell will provide the open protocols, standard interfaces, and Internet computing infrastructure necessary to make NetWare an ideal platform for Internet computing.

EMBRACING OPEN STANDARDS

As part of OSA, Novell is embracing Java across the NetWare platform and all network services. Embracing Java as the ideal Internet platform on which to build server-based solutions allows Novell to transition its traditionally proprietary network operating system to an open, high-performance platform for Java-based Internet applications. Novell is also embracing open standards such as Common Object Request Broker Architecture (CORBA) to build an Internet infrastructure for distributed object components. These—together with Novell's commitment to pure IP, Domain Naming Service (DNS)/Dynamic Host Configuration Protocol (DHCP) services, Netscape services, and other open standards—make NetWare an open, standards-based platform for Internet computing. (For more information about pure IP, DNS/DHCP services, and Netscape FastTrack Server for NetWare, see "NetWare 5 Knows No Limits," *NetWare Connection*, May 1998, pp. 6–21. You can download this article from http://www.novell.com/nwc/may98/ntware58.)

As Figure 1 shows, the Java Runtime Environment enables you to run Java-based applications on a NetWare server. (See p. 12.) The Java class libraries then allow these applications to access NetWare services. As a result, Java-based applications can take advantage of NetWare's speed and reliability and can access Novell's advanced networking services.

OSA also defines the architecture for interfaces and development tools to access network services. Applications can use the standard Java Development Kit (JDK) to open and access files stored on NetWare servers. Applications can also use the Java Naming and Directory Interface (JNDI) to access Novell Directory Services (NDS). OSA is designed to fully expose all of Novell's networking services through Java class libraries, JavaBeans, and Enterprise JavaBeans, thereby providing developers with the tools to build Internet solutions.

With Java, developers can quickly build and deploy applications on any node on the network. Most application development for Java has been on client systems, but Novell is focused on deploying Internet and intranet applications on NetWare servers. Using Java technology on the server enables faster performance, portability, and efficient partitioning of applications across clients and servers. As a result, developers can partition application logic to be executed at the point of the greatest economy and manageability.

However, writing an application in Java doesn't necessarily mean the application solves customer problems: Developers cannot address the cost of ownership and other customer problems without advanced networking services to extend the functionality of Java-based applications. For example, Novell's advanced networking services make applications easier to manage, secure, and license, and these services enable distribution and partitioning.

Through OSA, Novell will enhance and extend the pure Java model of "write once, run anywhere" by adding attributes that make applications easier to register, install, configure, manage, and update across the network. In short, OSA will provide the network architecture and developer tools to help lower the cost of ownership.

OSA DEVELOPMENT COMPONENTS

OSA is designed to embrace existing developer tools and frameworks from partners such as Netscape, IBM, Oracle, Microsoft, and others to extend an application's functionality to the network. Novell's DeveloperNet provides developers with the server components and tools to develop for, manage, and use Novell's new architecture and Java platform. Many components work on both NetWare 4.1x and NetWare 5. Also, each component has its own installation program, so you can install as few or as many components as you need.

Developers can become an electronic-level DeveloperNet member at no charge, and can then download all of the server components and tools described in the following sections. (For more information about DeveloperNet, visit Novell's DeveloperNet web site at http://developer.novell.com. To download these tools, go to http://developer.novell.com/sitemaps/kits.html.)

Kernel and Application Development

Before NetWare 5, developers had to write NetWare Loadable Modules (NLMs) to develop server-based applications. NLMs run in the same memory space as the NetWare kernel and provide high performance. Unfortunately, running in this memory space makes NLMs more difficult to develop, requiring skilled programmers.

With NetWare 5, NLMs can run in user memory space, which is located outside the NetWare kernel. This capability makes developing NetWare applications easier because developers can take advantage of protected and virtual memory, and they don't have to worry about applications corrupting the NetWare kernel and causing the server to abend.

Novell has formed strategic relationships with vendors, such as Metrowerks, to provide advanced developer tools to build server-based applications. Metrowerks CodeWarrior, for example, provides an advanced C/C++ and Java Integrated Development Environment (IDE) that fully supports the NetWare platform. (For more information about CodeWarrior, visit http://developer.novell.com/dev_resources/metrowerks.htm.)

Java Application Development

Developers can use Java to write extensions to NetWare that fully interact with NetWare services, web services, and database information (through Java Database Connectivity [JDBC]). The Java development components are listed below.

- **Novell JVM for NetWare.** The Java Virtual Machine (JVM) allows Java-based applications to run on NetWare 4.x and NetWare 5 servers. Novell also ships all of the standard JavaSoft JDK libraries and components, and NetWare supports standard extension APIs, such as JDBC and servlets.

  The JVM runs extremely fast within the NetWare kernel. In an independent test by KeyLabs, the NetWare 5 JVM ran more than twice as fast as the nearest contender. (For more information, visit http://developer.novell.com/java.)

  Novell is ensuring that NetWare continues to be the fastest platform for Java:

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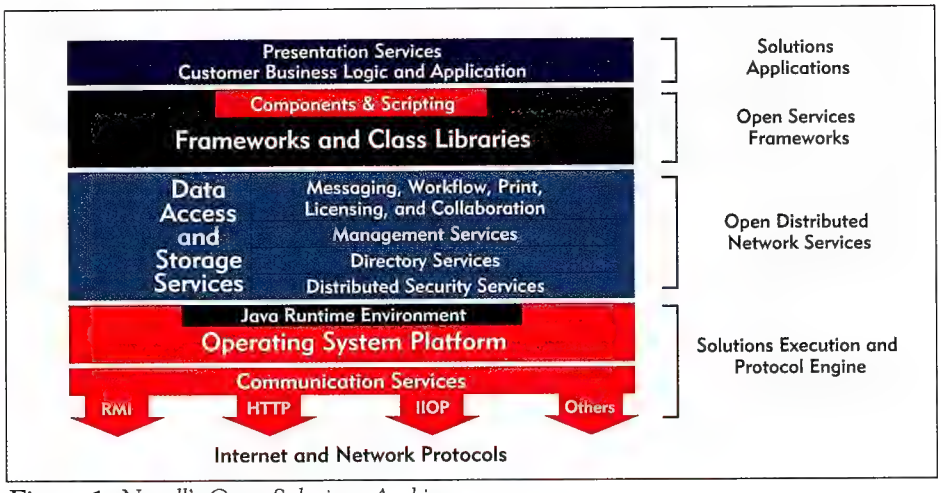

Figure 1. Novell's Open Solutions Architecture

Novell is working with Intel to create a JVM that will run on Intel processor-based servers, including symmetrical multiprocessing (SMP) servers and forthcoming IA-64 architecture servers. Novell plans to incorporate this JVM into NetWare in 1999. (For more information, visit http://novell.com/press.)

- **Sun Microsystems Java Runtime Environment 1.5.1i for Windows 95 and Windows NT.** This component provides NetWare clients with the files they need to run Java-based applications. Because these applications can run on any computer that supports a JVM, servers and workstations can run many of the same Java-based applications, such as Novell's ConsoleOne, which is explained below.
- **JavaBeans for Novell Services.** These easy-to-use components allow developers to quickly write Java-based applications using Rapid Application Development (RAD) tools that can access NetWare services, such as NDS, print queue management, server socket, and client socket services.
- **Novell Class Libraries and Frameworks for Java.** These class libraries and frameworks enable Java-based applications to access Novell's networking services through a single, consistent interface.
- **Novell ConsoleOne.** This application provides a GUI framework, or shell, that runs Java-based management applets (which are called snap-in modules). Because Novell wrote ConsoleOne with Java, you can use ConsoleOne and its management utilities on any computer that supports a JVM. (For more information about ConsoleOne, visit http://developer.novell.com/consoleone.)
- **Novell Installation Services (NIS).** This framework provides the infrastructure for creating server-based installation services on the NetWare platform. NIS includes standard installation capabilities, such as copying files from a CD-ROM, and GUI components to collect user preferences.

Internet Application Development

Web servers and application servers running on NetWare provide web publishing capabilities, scripting language support, and extended network services, such as application and database support.

- **Netscape FastTrack Server for NetWare.** This web server enables you to publish web documents and to run web-based applications using Common Gateway Interface (CGI), JavaScript, NetBasic, Perl 5, and Java. Netscape FastTrack Server runs 30 percent faster on NetWare than on any other platform. (For more information, visit http://www.novell.com/intranetware/products/netscape_servers.) NetWare also supports Netscape Enterprise Server.
- **WebLogic Tengah Application Server and Services.** This multithreaded Java application server provides a standard environment for Java-based applications in much the same way that Windows provides a standard environment for Windows-based applications. This application server offers a full suite of Java application development services, such as JDBC and JNDI interfaces, servlets, dynamic HyperText Markup Language (HTML), events, and session management. Tengah is Novell's Java application server that runs on the JVM. (For more information about Tengah, visit WebLogic's web site at http://www.weblogic.com.)

Scripting Application Development

Developers and network administrators can build solutions on NetWare using popular scripting languages (such as JavaScript, Perl 5, and Visual Basic scripts).

- **NetBasic 7.0.** This scripting language enables developers to use Visual Basic scripts on a NetWare server. Developers can use the Microsoft Visual Studio or any text editor to create scripts and then run them on NetWare. NetBasic 7.0 also enables developers to incorporate Java class libraries and JavaBeans into any NetBasic script. NetBasic scripts can access Novell's networking services, build dynamic HTML pages, interface with the web-server, and perform server-based administrative tasks.
- **Perl 5.** Developers can use Perl-based applications on NetWare, even if these applications were originally written to support other web servers. The LCGI Servlet Gateway enables developers to write Java servlets that run alongside Netscape FastTrack Server for NetWare.
- **JavaScript.** This scripting language is supported through the Netscape FastTrack WebServer, offering advanced HTML automation and scripting services for web publishing.

Distributed Computing Infrastructure

The Novell Object Request Broker (ORB) enables developers to run CORBA applications on NetWare 5 and NetWare 4.11. CORBA enables pieces of programs, or objects, to communicate with each other regardless of the programming language in which the objects were written or the operating system on which the objects run.

EVERYONE BENEFITS FROM OSA

The OSA strategy offers a win–win solution for everyone: Novell wins because it has a long-term strategy that brings greater value to the NetWare platform through open protocols and standard interfaces. Developers win because OSA allows them to build applications that are network aware, Internet ready, and manageable. You win because you have better tools and NDS-enabled applications that will help you manage everything connected to the network. Your company wins because it gets a better return on investment as applications leverage the performance, reliability, and manageability of NetWare.

Terry L Jeffress works for Niche Associates, an agency based in Salt Lake City.

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NetWare 3.2

Sandy Stevens

If it's not broken, why fix it? Thousands of NetWare 3 administrators have asked this question when considering whether or not to upgrade to intraNetWare. NetWare 3 continues to maintain significant customer loyalty and to add value to companies, as proven by an installed base of approximately 1.5 million servers worldwide. To address the needs of companies that have chosen not to upgrade to intraNetWare at this time, Novell has released NetWare 3.2, which provides both updates and enhancements for existing NetWare 3 servers.

MORE RELIABLE AND EASIER TO MANAGE

Whether you are planning to install a new NetWare 3.2 server or to upgrade from NetWare 3.11 or NetWare 3.12, you will find that NetWare 3.2 offers several features that make it worth the time and money. (For more information about various NetWare 3.2 purchasing options, see "Which NetWare 3.2 Purchasing Option Should You Choose?" on p. 20.) For example, NetWare 3.2 delivers the following features:

- NetWare 3 updates
- Year 2000 updates
- Network management utilities
- Updated 32-bit client software
- Two versions of Netscape Navigator
- Two-user version of intraNetWare

NETWARE 3 UPDATES

For years, NetWare 3 administrators have faced a continuous deluge of updates, including patches; fixes; and LAN, WAN, and disk driver updates. Although these updates are available free through Novell's Support Connection World-Wide Web site (http://support.novell.com), keeping track of these updates can be an enormous management task. Most NetWare 3 administrators have been forced to take a reactive approach to updates—first encounter a problem, and then see if an update is available to fix the problem.

NetWare 3.2 offers a solution to this dilemma by providing all of the current updates in one convenient package. With NetWare 3.2, these updates are automatically applied, eliminating the need for you to locate and download updates as problems occur.

YEAR 2000 UPDATES

You have probably heard a lot of horror stories about computer systems worldwide coming to a screeching halt on January 1, 2000 because these systems are not designed to support a four-digit date format. (For more information about the year 2000 problem, see "Exterminating the Millennium Bug Before It Wreaks Havoc on Your Company's Network," *NetWare Connection*, June 1998, pp. 8–20. You can download this article from http://www.novell.com/nwc/jun.98/yr200068.) Fortunately, you don't need to worry about your company's NetWare network: Novell has conducted extensive product testing to validate that the latest versions of most of its products are year 2000 ready. (For more information about Novell's year 2000 efforts, see "Novell's Project 2000: Making Novell's Products Year 2000 Ready," *NetWare Connection*, June 1998, pp. 22–23. You can download this article from http://www.novell.com/nwc/jun.98/pj200068.)

However, Novell is providing optional year 2000 updates for some of its products, including NetWare 3. According to John Canfield, Novell's year 2000 marketing manager, these updates "are not critical to the function of the operating system. Most of the problems we found are date display issues for which we have released the updates."

To make it easy for you to apply the optional year 2000 updates for NetWare 3, Novell has included these updates with NetWare 3.2. Novell has also included its latest 32-bit client software, which is year 2000 ready. (See the "Updated 32-Bit Client Software" section on p. 18.) By simply upgrading to NetWare 3.2 and installing the updated 32-bit client software, your company's network will be year 2000 ready, as long as all of the hardware and software you use on the network is also year 2000 ready.

Note. You can download year 2000 updates for other Novell products, such as intraNetWare, NetWare for Small Business, and BorderManager, from Novell's Project 2000 web site (http://www.novell.com/p2000/patches.html).

NETWORK MANAGEMENT UTILITIES

In addition, NetWare 3.2 includes new network management utilities, making it easier for you to manage your company's

network. The following utilities are the most significant:

- The Windows-based SYSCON utility
- The CONFIG NetWare Loadable Module (NLM) and the NetWare Config Reader utility
- Other useful utilities, such as the CRON NLM, the TBACKUP NLM, and the TCOPY NLM

Windows-Based SYSCON Utility

NetWare 3 administrators manage users and network resources through Novell's DOS-based SYSCON utility. Most experienced NetWare 3 administrators agree that this utility isn't too difficult to use, even if it is DOS based. After you become familiar with the various menu options, you can move through the screens with lightning speed. Personally, I like the DOS-based version of the SYSCON utility, but I must admit that using a DOS-based utility in a world dominated by Windows seems somewhat archaic.

To bring NetWare 3 up-to-date, Novell has included a Windows-based version of the SYSCON utility with NetWare 3.2. As shown in Figure 1, the Windows-based SYSCON utility provides a graphical, hierarchical view of your company's network, allowing you to manage any version of NetWare 3. (See p. 16.)

Although Figure 1 shows multiple NetWare 3 servers in a hierarchical view, don't be fooled: Like other versions of NetWare 3, NetWare 3.2 uses a flat-file bindery for storing network information, such as information about users, groups, and printers. In fact, you can see that the top of the hierarchical view in Figure 1 displays server objects, which contain users and groups at the same level—just as the bindery does. (See p. 16.)

Although the Windows-based SYSCON utility is bound by the limitations of the bindery, this utility offers several time-saving features over the DOS-based version: For example, the Windows-based SYSCON utility allows you to conveniently manage multiple NetWare 3 servers from a single GUI. Of course, to manage multiple NetWare 3 servers, you must be authenticated to each NetWare 3 server as the SUPERVISOR user or as a SUPERVISOR-equivalent user.

The management options available in the Windows-based SYSCON utility are nearly identical to the management options available in the DOS-based version. (See Figure 2 on p. 16.) However, the Windows-based SYSCON utility also allows you to perform some limited management tasks across NetWare 3 servers. For example, you can copy login scripts and configuration files to multiple NetWare 3 servers by using the Windows-based cut and paste features. You can also view user and server configuration information in separate windows simultaneously, and you can print user configuration information. (See Figure 3 on p. 18.)

The Windows-based SYSCON utility does have one drawback: It does not offer any drag-and-drop capabilities—either within a single bindery or across NetWare 3 servers.

In general, I find the Windows-based SYSCON utility to be intuitive and easy

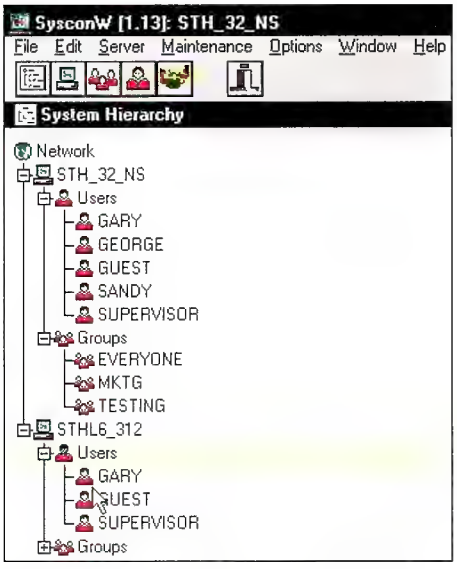

Figure 1. The Windows-based SYSCON utility provides a graphical view of your company's network.

to use. However, as mentioned earlier, you are still bound by the limitations of the bindery. One major limitation is that each NetWare 3 server has its own bindery that you must maintain independently of other NetWare 3 servers. As a result, you must perform redundant management tasks, such as creating and maintaining a separate user account on each NetWare 3 server a user must access.

This limitation can be addressed only by Novell Directory Services (NDS). So when redundant management tasks become overwhelming in a NetWare 3 environment, it is time to upgrade to intraNetWare or NetWare 5.

CONFIG NLM and the NetWare Config Reader Utility

As mentioned earlier, NetWare 3 administrators must constantly ensure that they have applied the latest updates to their NetWare 3 servers—a problem that Novell has solved by including all of the current updates with NetWare 3.2. NetWare 3 administrators must also keep track of the patch levels and NLM versions running on their NetWare 3 servers. Novell has solved this problem as well by including the CONFIG NLM and the NetWare Config Reader utility in NetWare 3.2.

These utilities work together to gather and verify the patch levels and NLM versions on a NetWare 3 server. These utilities then compare the configuration information to the latest configuration recommendations available from Novell and to other NetWare 3 servers on your company's network.

When you run the CONFIG NLM at the server console, all of the NetWare 3 server's configuration information, including the patch levels and NLM versions running on this server, are written to a text file called CONFIG.TXT. Then the NetWare Config Reader utility uses this file, which is stored in the SYS:SYSTEM directory, to compare the server's configuration information with the latest configuration recommendations available from Novell. You can download these configuration recommendations from Novell's Support Connection web site by selecting the Download option from within the NetWare Config Reader utility.

Figure 4 shows the NetWare Config Reader utility's analysis of a NetWare 3.12 server called HOU-TOMI. (See p. 18.) In Figure 4, the STREAMS NLM is highlighted in red, which indicates that this NLM is out of date and should be updated. If any of the NLMs listed in the Patches window were out of date, these NLMs would also be highlighted in red.

You could select the Suggestions tab in the NetWare Config Reader utility to view a summary of possible problems on the HOU-TOMI server and suggestions for how to fix these problems. For example, Figure 5 shows that the STREAMS NLM is out of date, that the latest NetWare 3.12 patch set needs to be loaded, and that a particular SET parameter should be modified. (See p. 20.)

With the NetWare Config Reader utility, you could also view the HOU-TOMI server's entire CONFIG.TXT file, NCF and DOS files, volumes statistics, and information about which interrupts are currently being used. In addition, you could compare the HOU-TOMI server's CONFIG.TXT file to the CONFIG.TXT file on another NetWare 3 server.

As you can see, the CONFIG NLM and the NetWare Config Reader utility are valuable management tools, whether your company has one NetWare 3 server or 50. These utilities take the guesswork out of troubleshooting many common NetWare 3 problems.

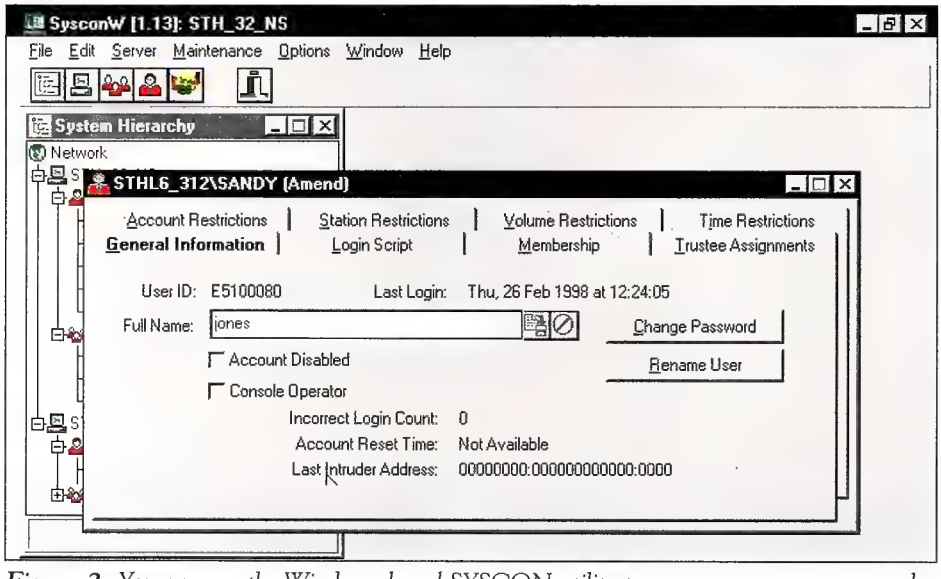

Figure 2. You can use the Windows-based SYSCON utility to manage user accounts and network resources on all of the NetWare 3 servers on your company's network.

Other Useful Utilities

Novell has also included other useful utilities with NetWare 3.2, including the CRON NLM, the TBACKUP NLM, and the TCOPY NLM. The CRON NLM provides a quick and easy way to schedule server console commands, such as loading and unloading NLMs at specific times. For example, you could configure the CRON NLM to automatically load a backup NLM at 2 a.m. daily and to automatically unload this NLM after the backup process is completed. You can even use the CRON NLM to shut down a NetWare 3 server at a specific time

In addition, you can view all of the server console commands that you have scheduled using the CRON NLM. The schedule for each NetWare 3 server is

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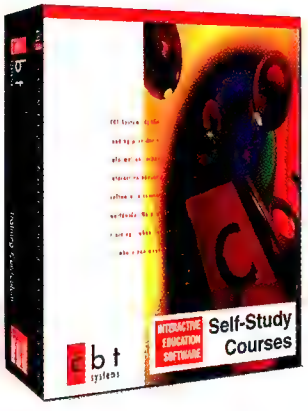

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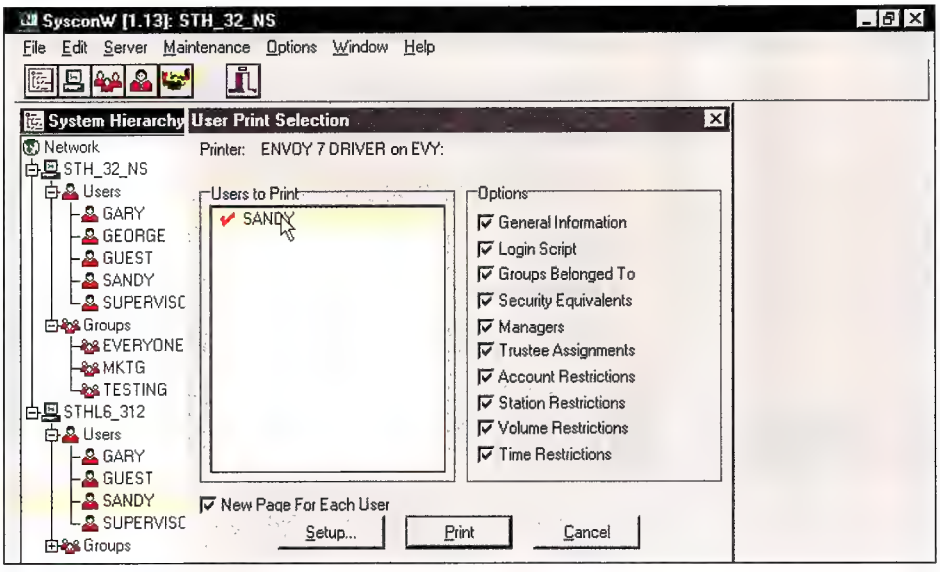

Figure 3. The Windows-based SYSCON utility allows you to view and print information about users.

stored in the CRONTAB file, which is located in the SYS:SYSTEM directory.

Like the CRON NLM, the TBACKUP and the TCOPY NLM simplify network management tasks. These utilities allow you to back up and restore trustee assignments and inherited rights masks.

Far too often, trustee assignments and inherited rights masks are not properly backed up—a fact that many NetWare 3 administrators don't discover until they try to restore trustee assignments and inherited rights masks after a server failure or upgrade. With the TBACKUP NLM, you can back up the trustee assignments and inherited rights masks on a NetWare server. The TBACKUP NLM creates the TRESTORE.BAT file, which you can run later to restore these trustee assignments and inherited rights masks.

The TCOPY NLM, on the other hand, allows you to copy trustee assignments from one directory structure to another. This capability is especially useful when you are migrating data across NetWare 3 servers.

UPDATED 32-BIT CLIENT SOFTWARE

As mentioned earlier, NetWare 3.2 includes the latest 32-bit Novell client software:

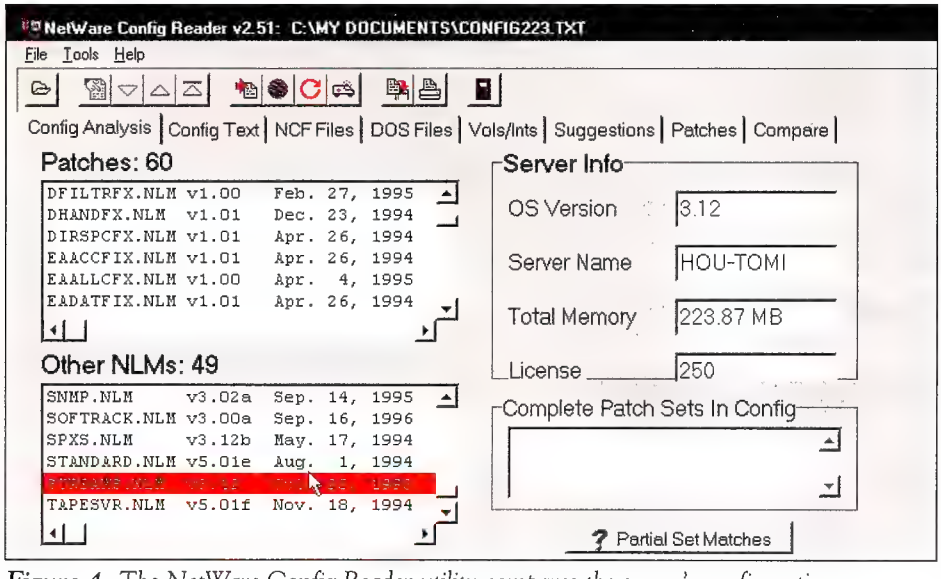

Figure 4. The NetWare Config Reader utility compares the server's configuration information with the configuration recommended by Novell.

- intraNetWare Client 4.11 for Windows NT
- intraNetWare Client 2.2 for Windows 95
- intraNetWare Client 2.2 for DOS and Windows

This client software offers some significant improvements over previous versions of Novell's client software: When you install the latest 32-bit client software, the first improvement you will notice is a significant increase in performance. Because this client software is 32-bit enabled, you have faster access to network services and network resources.

The latest 32-bit client software also offers increased performance through its support of Novell's packet burst technology, which allows the client software to transmit multiple packets across the network before requiring an acknowledgment from the recipient. In addition, this client software supports Novell's Large Internet Packet (LIP) technology, which decreases the number of packets transmitted across bridges and routers by enabling each packet to be larger than 512 bytes, thus enhancing throughput.

In addition, the latest 32-bit client software is implemented as a set of NLMs, which replaces the Virtual Loadable Module (VLM) architecture that was used in older, 16-bit versions of Novell's client software. Using an NLM architecture makes the client software dynamic, modular, and portable. For example, the same NLM-based LAN drivers that you install on a NetWare 3 server can now be installed on workstations as well.

The latest 32-bit client software also offers a graphical login, rather than the cumbersome DOS-based login used with older, 16-bit versions of Novell client software. (See Figure 6 on p. 21.) With this graphical login, users can quickly and easily log in to NetWare 3 servers from within Windows.

Finally, the latest 32-bit client software offers an autoreconnect feature: If the network connection is temporarily lost, the client software automatically tries to reestablish a user's network connection, along with any associated drive and printer mappings.

Although these improvements are appealing, the thought of upgrading the client software on every workstation on your company's network can be disconcerting. The good news is that you

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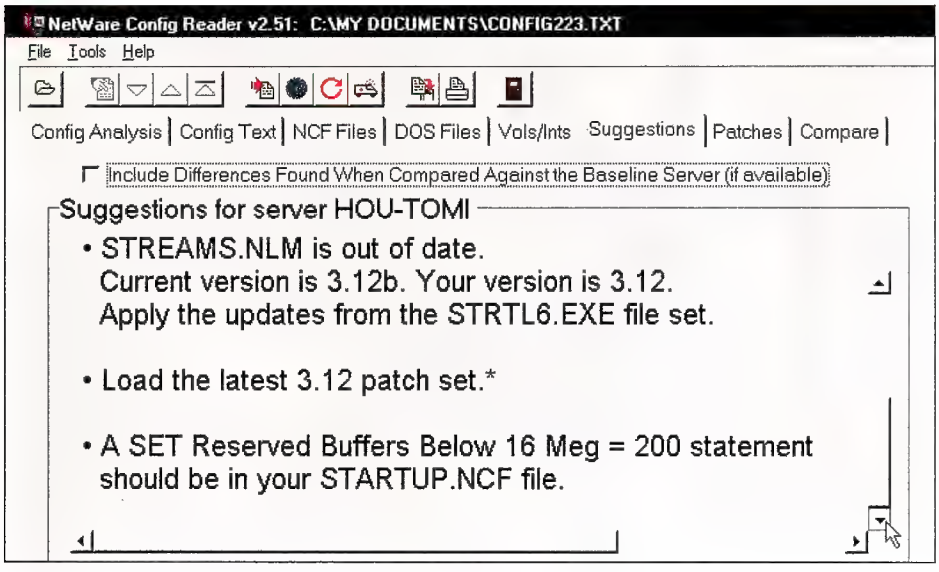

Figure 5. *The NetWare Config Reader utility summarizes the possible problems on a NetWare 3 server and provides suggestions for fixing these problems.*

don't have to upgrade every workstation: All client software that shipped with previous versions of NetWare 3 are fully backward compatible with NetWare 3.2.

The even better news is that when you are ready to begin upgrading the client software, you can use NetWare 3.2's automatic client upgrade (ACU) feature to perform the upgrade process in a few easy steps. The ACU feature allows you to set up the necessary directories, configuration files, and login scripts so that the new client software is automatically installed on users' workstations when these users log in to a NetWare 3.2 server.

TWO VERSIONS OF NETSCAPE NAVIGATOR

In addition to offering Novell updates, utilities, and client software, NetWare 3.2 includes two versions of Netscape Navigator: Netscape Navigator 4.04 and Netscape Navigator 3.01, both of which support Windows NT, Windows 95, Windows 3.x, Macintosh on the Power PC processor, and Macintosh on the 68000 processor. Since accessing the Internet has become a daily necessity for most users, offering a network operating system and a web browser in one package makes sense.

When you purchase or upgrade to NetWare 3.2, you receive the number of Netscape Navigator user licenses that match the number of NetWare 3.2 user licenses you own. For example, if you purchased a 10-user version of NetWare 3.2, you would receive 10 Netscape Navigator user licenses.

TWO-USER VERSION OF INTRANETWARE

Finally, NetWare 3.2 includes a fully functional, two-user version of intraNetWare, which allows you to evaluate the benefits of intraNetWare and NDS. This little gesture alone sends a strong message from Novell: Although you may not have chosen to upgrade to intraNetWare at this time, you might want to take a closer look at what you are missing.

Which NetWare 3.2 Purchasing Option Should You Choose?

Novell offers three purchasing options for NetWare 3.2. The purchasing option you choose depends on whether you are upgrading an existing NetWare 3 server and what version of NetWare 3 this server is currently running.

Purchasing Option	Availability	Pricing
NetWare 3.2 Enhancement Pack	Available if you are upgrading from NetWare 3.12 to NetWare 3.2.	Pricing is stratified on a per-server basis. The suggested retail price per server is U.S. $349.
NetWare 3.2 Upgrade	Available if you are upgrading from older versions of NetWare, such as NetWare 3.11, to NetWare 3.2. The product includes the upgrade to NetWare 3.12 and the NetWare 3.2 Enhancement Pack.	Pricing is stratified on a per-user basis. The suggested retail price for five to 10 users is U.S. $1,895.
New NetWare 3.2 Product	Available if you are installing a new NetWare 3.2 server. This product includes NetWare 3.12 and the NetWare 3.2 Enhancement Pack.	Pricing is stratified on a per-user basis. The suggested retail price for five users is U.S. $1,095.

For detailed product and pricing information, visit Novell's World-Wide Web site (http://www.novell.com/products/netware3). You can also call 1-888-321-4272 or 1-801-228-4272.

CONCLUSION

With NetWare 3.2, Novell has done more than simply bundle existing software for resale. NetWare 3.2 provides many solid enhancements that make this product worth the cost and effort to upgrade. And although you can download some of the NetWare 3.2 components (such as updates) from Novell's Support Connection web site, having all of these components on a single CD-ROM is extremely convenient. You will not only avoid the time-consuming task of figuring out what to download and where to download it from, but you will also be able to manage your company's network more easily.

If you are looking for a good workgroup solution, you should seriously consider using NetWare 3.2. Because NetWare 3 has been on the market for more than 9 years and has 1.5 million servers installed, NetWare 3.2 is certainly a sure bet.

For more information about NetWare 3.2, visit Novell's web site (http://www.novell.com/products/netware3). You can also call 1-888-321-4272 or 1-801-228-4272.

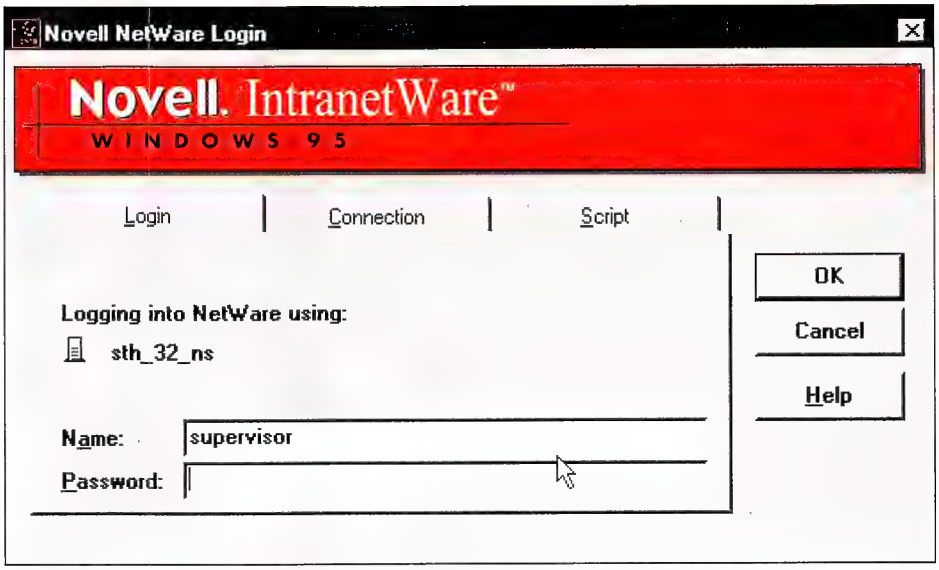

Figure 6. Novell's updated 32-bit client software offers a graphical login.

Sandy Stevens is a freelance writer based in Salt Lake City, Utah. She is the coauthor of Novell's Guide to NetWare Printing, Novell's Guide to Integrating IntranetWare and NT, *and* Novell's Guide to BorderManager, *all of which are available from Novell Press.*

Increasing Network Throughput

Mickey Applebaum

Editor's Note: "Technically Speaking" answers your technical questions, focusing on issues that affect network administrators. To submit a question for a future column, please send an e-mail message to nwceditors@novell.com, or fax the question to 1-801-228-4576.

The last issue of *NetWare Connection* explained what a switch does and when you should install a switch on your company's network to improve performance. (See "Switching to Switches," *NetWare Connection*, June 1998, pp. 33–34. You can download this article from http://www.novell.com/nwc/jun.98/techsp68.) To improve performance even more, you can install multiple network interface boards in a server. You can then increase throughput between the server and the switch by implementing one of the following solutions:

- Load balancing, which is built into Novell's NetWare Link Services Protocol (NLSP) extension for IPX
- Port aggregation, which is built into specialized network interface boards and hardware drivers

This article explains how each solution works. To help you decide which solution is best for your company's network, this article also lists the hardware requirements and performance issues associated with each solution. For example, when not properly configured, load balancing can actually reduce performance. (For more information about potential configuration problems, see document number 2910835 on Novell's Support Connection site. To view this document and other documents mentioned in this article, go to http://support.novell.com, and select the KnowledgeBase option. Then enter the document number in the search field, and click the Find button.)

LOAD BALANCING

Load balancing increases network throughput by distributing the network load across multiple network interface boards in a server. With load balancing, the server can send packets through multiple network interface boards connected to the same segment, rather than using only one network interface board, which can become a bottleneck.

Load balancing is an outbound service, handling only packets being sent from the server. Incoming packets still determine their route based on the server's responses to workstations' Get Nearest Server requests. Although incoming packets are not load balanced, the server's responses to these requests are.

To determine which network interface board should reply to which packet, the server builds a routing table that includes the media access control (MAC) address of each network interface board connected to the same segment and assigns a unique sequence number to each network interface board. The server uses this routing table to ensure that the network load is distributed among the network interface boards.

The first time the server needs to send a packet using the routing table, the server sends this packet through the first network interface board listed in this routing table. The server then sends the second packet through the second network interface board, the third packet through the third network interface board, and so on. Once all network interface boards have been used, the server starts over with the first network interface board. (See document number 2926169 on Novell's Support Connection web site.)

For example, suppose that a server contained two network interface boards enabled for load balancing and that the server received Get Nearest Server requests from three workstations connected to that server. To reply to the first workstation, the server would send a response through the first network interface board in the routing table. To reply to the second workstation, the server would send a response through the second network interface board. And to reply to the third workstation, the server would go back to the first network interface board to send a response.

Hardware Requirements

Before you decide whether to enable load balancing, you should know that Novell's load-balancing services require specific hardware. First, you must install multiple network interface boards in a server. (You can also install one multiport network interface board and connect all of the ports to the switch.)

With load balancing, you can use any network interface boards and hardware drivers that support Open Data-link Interface (ODI) Server Specification 3.2 or above. (Hardware drivers that support this specification also support NLSP.) In addition, you can install any combination of network interface boards in the server. For example, you could enable load balancing on a server in which you had installed a network interface board from 3Com and a network interface board from Intel.

Second, you must install a switch on the same segment as the server that contains multiple network interface boards. Of course, Novell's load-balancing services allow you to distribute the network load across multiple network interface boards that are connected to any device on the same segment, such as a standard hub. However, you will not receive a performance benefit unless you connect the network interface boards to a switch, which enables concurrent packets to travel to and from the server.

Third, the segment on which the server resides cannot contain a bridge. If the server were connected to two segments through a bridge, the network interface board connected to

segment A could send a reply through the bridge to a workstation on segment B. As a result, performance could be degraded. (See document number 2926169 on Novell's Support Connection web site.)

As mentioned earlier, Novell's load-balancing services are built into NLSP, which is implemented as an enhancement to IPX. Because load balancing using NLSP is IPX specific, you cannot use this type of load-balancing with other protocols, such as TCP/IP and AppleTalk. Novell's load-balancing services support TCP/IP only across WAN links that use the Open Shortest Path First (OSPF) routing extension to TCP/IP. (See document number 2924197 on Novell's Support Connection web site.)

Performance Issues

You should also consider two performance issues as you decide whether to enable load balancing. First, each additional network interface board you install in a server does not provide a 100 percent increase in network throughput. In fact, load balancing offers diminishing returns: One additional network interface board may increase network throughput by up to 50 percent, while a second additional network interface board may increase network throughput by only 33 percent more. And the third additional network interface board may increase network throughput by only 25 percent more.

Second, if a majority of workstations established a connection to the server through one network interface board, this board will respond to the majority of incoming packets. For example, suppose a server contained two network interface boards. If the first network interface board were busy when 10 workstations sent Get Nearest Server requests, the second network interface board would respond to these workstations. Once a workstation establishes a connection through a specific network interface board, that network interface board responds to all packets the workstation sends to the server until this workstation changes its connection to another network interface board.

You can try changing the workstation's connection by rebooting the workstation, which forces it to reestablish the connection. However, there is no way to ensure that the workstation establishes this connection through a different network interface board. Because you have no control over which network interface board the server will use to send a response to the workstation's Get Nearest Server request, this workstation may establish a connection through the same network interface board to which the workstation was previously connected.

No Autoreconnect

In addition, you should know that if you enable load balancing on a server, the server cannot automatically reestablish a workstation's connection if this connection is lost. (See document number 1004697 on Novell's Support Connection web site). As a result, if autoreconnect capabilities are critical to a network, you should not use load balancing.

Losing autoreconnect capabilities can cause a problem: If the connection between the switch and one of the server's network interface boards were lost, the

server would be unaware of this lost connection and would continue to send packets through the network interface board. As a result, workstations would lose their connections to the server and could not reestablish these connections because the server would not recognize that the workstations were no longer connected.

Enabling Load-Balancing Services

To enable Novell's load-balancing services, you must install multiple network interface boards in the server, and you must connect these network interface boards to a switch on the same segment. You must then complete the following steps at the server console:

1. Load the INETCFG utility by entering this command at the server console:

   ```
   LOAD INETCFG
   ```

2. Select the IPX option from the Protocols menu, and then select the NLSP option to enable NLSP.
3. Select the IPX Expert Configuration option from the IPX menu. In the Maximum Number of Path Splits field, enter the number of network interface boards in the server that are connected to the network or the number of ports in the server that are connected to a switch. The highest number you can enter is 8.
4. Select the Load Balance NCP Packets to Local Clients option from the IPX menu; then select the Enabled option.
5. Save your changes, and exit the INETCFG utility.
6. Next, view the NETINFO.CFG file, which is located in the SYS/ETC directory, to ensure that the following line appears in this file:

   ```
   LOAD IPXRTR ROUTING=NLSP
   ```

   If this line does not appear, add it to the server's AUTOEXEC.NCF file before the SYS:ETC\INITSYS.NCF command.
7. Ensure that the following line appears after the LOAD IPXRTR command in the NETINFO.CFG file:

   ```
   SET LOAD BALANCE LOCAL LAN=ON
   ```

   If this line does not appear, add it to the server's AUTOEXEC.NCF file after the SYS:ETC\INITSYS.NCF command.

PORT AGGREGATION

Port aggregation also increases network throughput by distributing the network load across multiple network interface boards in a server. With port aggregation, however, the network interface boards are combined to create one virtual network interface board with multiple ports. The switch is connected to the server through this virtual network interface board.

For example, suppose that a switch were connected to a server containing two network interface boards, which were combined to create one virtual network interface board with two ports. When the virtual network interface board received a packet, a port aggregation driver would split the packet evenly across both ports, sending the portions of this packet to the server in a single action. The server and the switch negotiate how the packet is split across the ports and generate a sequence for reassembling the packet.

Hardware Requirements

Port aggregation requires specialized network interface boards and port aggregation drivers, in addition to a switch. These specialized network interface boards and port aggregation drivers usually cost more than standard network interface boards and drivers.

Adaptec Inc. is the only company I know of that provides specialized network interface boards and port aggregation drivers that offer full-port aggregation services for a NetWare network. Adaptec makes DuraLAN Fast Ethernet network interface boards and Duralink port aggregation drivers. (For more information about DuraLAN, go to http://www.adaptec.com/adaptec/press/release980427a.html. For more information about Duralink, go to http://www.adaptec.com/products/overview/portaggregation.html.)

In addition to specialized network interface boards and port aggregation drivers, port aggregation requires a switch, which must be located on the same segment as the server that contains the specialized network interface boards. (Port aggregation does not work with a standard hub.) You must then connect the specialized network interface boards to the switch, thus enabling concurrent packets to travel to and from the server.

Although you may have to pay more to implement port aggregation because you have to purchase specialized network interface boards and port aggregation drivers, this solution does offer a significant advantage: Because port aggregation is based on hardware rather than on protocol extensions, port aggregation is protocol independent. As a result, port aggregation works with IPX, TCP/IP, AppleTalk, and any other protocol bound to the virtual network interface board. Port aggregation also works with both incoming and outgoing packets, evenly distributing these packets across ports.

Performance Issues

Port aggregation addresses the performance issues associated with load balancing. In terms of raw network throughput, port aggregation offers a one-to-one ratio of added network interface boards and increased network throughput. For example, if you added a second, specialized network interface board to a server, you would increase network throughput from 10 Mbit/s to 20 Mbit/s in an Ethernet environment. You would increase network throughput from 100 Mbit/s to 200 Mbit/s in a Fast Ethernet environment.

With port aggregation, you can increase network throughput even more by running the virtual network interface board in full-duplex mode, if the switch you are using supports full-duplex mode. (Full-duplex mode allows the virtual network interface board and the switch to send and receive packets simultaneously.)

Port aggregation also provides a resilient link: If the connection between the switch and one of the server's network interface boards were lost, the virtual network interface board would simply disable the port associated with the lost connection. The remaining ports then continue to operate normally. As a result, one lost connection does not prevent workstations from connecting to the server.

CONCLUSION

If you implement load balancing or port aggregation in a properly configured switched environment, you can increase throughput from the server to the switch. You should use Novell's load-balancing services if you want to increase network throughput over IPX and if you do not need a resilient link. If you want to use other protocols or if you do need a resilient link, you should use port aggregation.

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Terry L Jeffress

Enabling FTP Services for intraNetWare

Illustration: The Dynamic Duo Studio

Have you ever sat at home, wishing you could somehow access a file on your company's intraNetWare network? Have you ever worked from a non-NetWare client and needed a file from an intraNetWare volume? UNIX systems solve these types of problems for UNIX users with File Transfer Protocol (FTP), and FTP Services for intraNetWare can solve these types of problems for intraNetWare users.

FTP is a TCP/IP service that enables you to copy a file from any Internet host to any other Internet host, regardless of the host's platform. (If you are not familiar with FTP, see "What Is File Transfer Protocol?" on p. 29.) Need a file from the office? With an FTP server running on your company's network, you can get that file by dialing in to the Internet and downloading the file using the FTP client software on your home computer.

Need a file from another file system on your company's network? If you are using a workstation that has FTP client software installed, you can download the file from the other file system's FTP server.

FTP client software exists for almost every platform, and nearly every World-Wide Web browser provides FTP capabilities. Also, FTP server software exists for most network operating systems—including intraNetWare.

FTP Services for intraNetWare is included with intraNetWare. By installing FTP Services for intraNetWare on one server, you can enable users to access files from any intraNetWare server on your company's network—not just the server running FTP Services for intraNetWare. As part of FTP, you can require users to authenticate to your company's network before accessing any files. And of course, through Novell Directory Services (NDS), you can control each user's ability to access files on a file-by-file basis, regardless of how users choose to access these files.

This article explains how to install, enable, and access FTP Services for intraNetWare. This article also explains how to configure and monitor FTP Services for intraNetWare.

INSTALLING AND ENABLING FTP SERVICES FOR INTRANETWARE

You use the INSTALL NetWare Loadable Module (NLM) to install FTP Services for intraNetWare, which is located on the FTP Services for intraNetWare CD-ROM that ships with intraNetWare. Before you install FTP Services for intraNetWare, your company's network must meet the following requirements:

- The server must be running NetWare 4.1 or above.
- The server must have at least 12 MB of RAM.
- The server must have 5 MB of available hard drive space.
- DOS must be resident on the server. (You cannot install FTP Services for intraNetWare if you have entered the REMOVE DOS command at the server console.)
- TCP/IP must be loaded and configured on the network, which must be using the Ethernet_II frame type.

To install FTP Services for intraNetWare, you must be able to log in to the server as the ADMIN user or as another user with the following rights:

- All rights except Supervisor and Access Control to the SYS:SYSTEM and SYS:ETC directories on the intraNetWare server
- Supervisor rights to the Organization or Organizational Unit (OU) object in which the installation program must create new NDS objects

If your company's network meets these requirements, you complete the following steps to install and enable FTP Services for intraNetWare:

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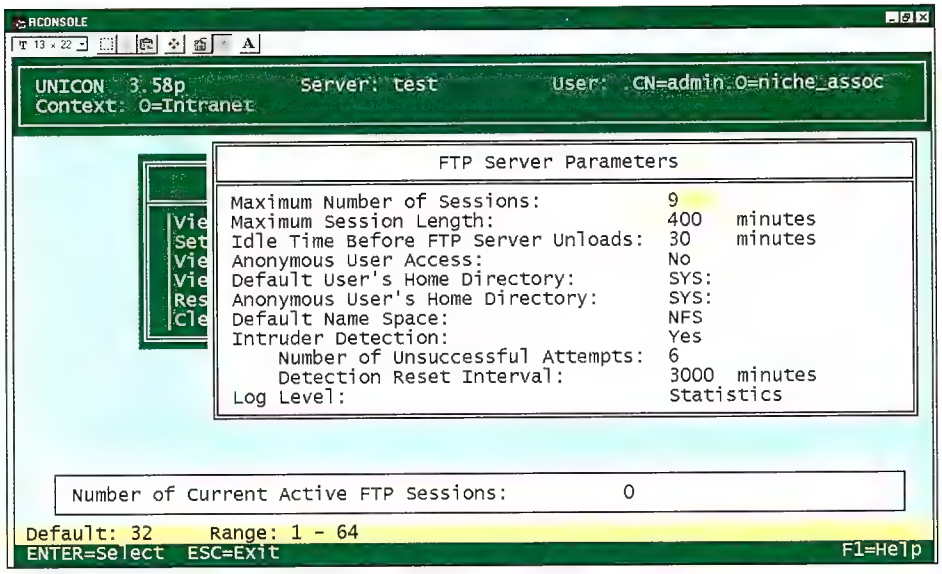

Figure 1. *You can use the UNICON utility to configure FTP Services for intraNetWare.*

1. At the server console, enter the following command:

   LOAD INSTALL

2. Select the Product option from the Installation Options menu.
3. Select the Install a Product Not Listed option from the Other Installations Options menu. The installation program prompts you to insert the first installation diskette for the product you want to install. (By default, the installation program looks in the server's A drive.)
4. Insert the FTP Services for intraNetWare CD-ROM into the server's CD-ROM drive.
5. Press the F3 key, and enter the path to the NWUXPS directory on the FTP Services for intraNetWare CD-ROM. For example, you might enter D:\NWUXPS for a server that is configured to read the CD-ROM through the D drive. After entering the correct directory path, press the Enter key.
6. A message appears, explaining that the installation program found a README file on the CD-ROM. Press the Escape key to continue.
7. A message appears, asking if you want to read the README file. Select No, and press the Enter key.
8. The installation program begins installing the FTP Services for intraNetWare files and prompts you to enter the directory path to the server's SERVER.EXE file. (On many servers, the directory path is C:\NWSERVER.) Enter the correct directory path, and press the Enter key.
9. A message appears, asking if you want to install the documentation. Select Yes or No, and press the Enter key.
10. If a message appears warning you that the HOSTS.DB file does not exist, press any key to clear the message. If you were going to run Domain Naming System (DNS) on this server, you would need to provide a HOSTS.DB file, but you do not need this file to run FTP Services for intraNetWare.
11. After installing the FTP Services for intraNetWare files, the installation program loads the UNICON utility, which prompts you to log in to the NDS tree. All of the files the server needs to run FTP Services for intraNetWare now reside on this server, but you must use the UNICON utility to enable these services.
12. The UNICON utility displays the Available Name Service Options menu, which includes options to install DNS and Network Information Services (NIS). To run FTP Services for intraNetWare, the server does not need either DNS or NIS, so select the No DNS and Remote NIS option. (The FTP Services for intraNetWare CD-ROM also includes software for UNIX file and print connectivity, which requires DNS and NIS.)
13. The UNICON utility displays a message about DNS and NIS. Press the Enter key to continue.
14. The Setup (No DNS and Remote NIS) Name Service dialog box appears. Accept the default values, and press the Escape key to continue.
15. A message appears, asking if you want to continue installing name services. Select Yes, and press the Enter key.
16. Another message appears, asking if you want to initialize the NIS database. Select No, and press the Enter key.
17. The Product Initialization Status screen appears. When the initialization process is completed, press the Escape key to continue.
18. The Running Services screen, which is empty, appears. Press the Insert key.
19. Select the FTP Server option, and press the Enter key.
20. Press the Escape key five times to close all of the installation screens, and press the Enter key to unload both the installation program and the UNICON utility.

After you enable FTP Services for intraNetWare, the FTP Services NLMs remain unloaded until a user requests an FTP session. The first time a server running FTP Services for intraNetWare receives an FTP login request, the server loads the FTP Services NLMs. By loading these NLMs only when they are needed, the server saves memory and other system resources. If no users request an FTP session for the period of time that you specify in the Idle Time Before FTP Server Unloads parameter, the server automatically unloads the NLMs. (See the "Changing Parameters" section on p. 30.)

ACCESSING FTP SERVICES FOR INTRANETWARE

At this point, you have installed and enabled FTP Services for intraNetWare. If you want to allow all users to access your company's network through FTP, you don't need to make any configuration changes. By default, FTP Services for intraNetWare enables all NDS users to access your company's network through FTP. (If you want to control FTP access to your company's network, see the "Restricting FTP Access" section on p. 31.)

However, FTP Services for intraNetWare does enforces all of the intraNetWare file system access controls you have established. For example, suppose that user Jane did not have rights to access the SYS volume on a particular server. If Jane tried to access the SYS volume from a workstation running

What Is File Transfer Protocol?

If you have downloaded files from the Internet, you have probably used File Transfer Protocol (FTP). FTP is a TCP/IP service that enables you to transfer a file from any Internet host to any other Internet host. It doesn't matter where the two computers are located, how they are connected, or even whether or not these computers are using the same operating system.

FTP follows a client-server model: You use FTP client software to connect to an FTP server. When you begin an FTP session, the FTP server responds with a request for your username and password. After the FTP server authenticates you, you can enter FTP commands. For example, you could enter an FTP command requesting a particular file from the FTP server. The FTP server would respond to this request by sending the file.

Many companies use FTP to allow Internet users to access demonstration software and other files stored on the companies' networks. In most cases, these companies allow any Internet user to access the files without providing a username and password. Internet users that can access files through FTP without providing a username and password are called *anonymous users*.

When you use FTP from a UNIX workstation or through a Telnet session, you usually have to enter FTP commands through a command-line interface. However, if your operating system supports a GUI, the FTP client software you are using probably displays a simple interface and enters all of the FTP commands for you. For example, most Windows-based FTP client software displays a list of the FTP server's files in a window that looks similar to the Windows Explorer interface, enabling you to transfer files from this server as easily as you copy files from one directory to another.

Using FTP to access files is, in many ways, similar to using intraNetWare to access files. Both FTP and intraNetWare use the client-server model. To access files on an intraNetWare server, a user runs intraNetWare client software, which contacts the server. This server then authenticates the user and grants this user access only to the files to which he or she has rights.

An FTP server, like an intraNetWare server, enforces all of the file system access controls you have established on the FTP server. As a result, an FTP server does not allow you to view, modify, or delete files to which you have not been granted the necessary rights.

intraNetWare client software, FTP Services for intraNetWare would prevent Jane from accessing this volume through FTP. Also, by default, FTP Services for intraNetWare does not allow anonymous users to use FTP to retrieve files from your company's network.

After you enable FTP Services for intraNetWare, users can access your company's network through FTP client software such as the FTP client software available in Netscape Navigator and Microsoft Internet Explorer. For example, if user Sean wanted to access files in the HOME/SEAN directory on a particular SYS volume, he would enter a URL similar to the following in his web browser:

ftp://sean:*password*@www.*ftpserver*.com/SYS/HOME/SEAN

You should notify users that FTP Services for intraNetWare supports only DOS and Network File System (NFS) name spaces. By default, FTP Services for intraNetWare presents all directory lists from the DOS name space. As a result, users will be unable to view the complete names of files stored in LONG name spaces. All of the files users transfer will have a shortened DOS name.

CONFIGURING AND MONITORING FTP SERVICES FOR INTRANETWARE

FTP Services for intraNetWare allows you to control certain aspects of FTP sessions, such as the maximum length of each session. You can also monitor active FTP sessions, manually disconnect users from the server running FTP Services for intraNetWare, and restrict users' FTP access.

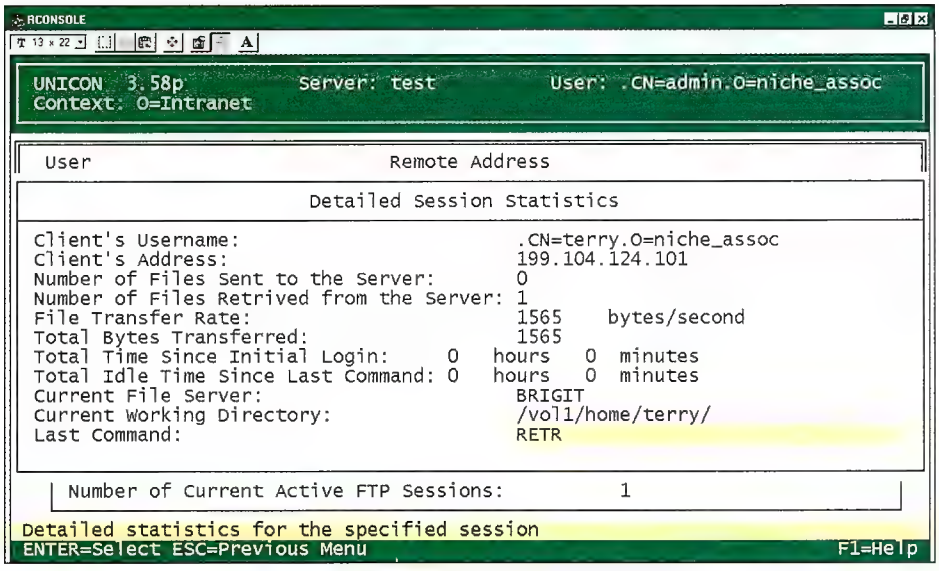

Figure 2. *With the UNICON utility, you can monitor a user's FTP session, viewing information such as the user's name and IP address.*

To configure and monitor FTP Services for intraNetWare, you use the UNICON utility. The next sections explain how you can configure FTP Services for intraNetWare. (You load the UNICON utility by typing LOAD UNICON at the server console.)

Changing Parameters

If you want to impose more controls on FTP sessions, you must change the FTP Services for intraNetWare parameters. To change these parameters, you complete the following steps:

1. Select the Manage Services option from the UNICON utility's main menu.
2. Select the FTP Server option, and then select the Set Parameters option.
3. The FTP Server Parameters screen appears. (See Figure 1 on p. 28.) To change a parameter, you highlight the value you want to change, type the new value, and press the Enter key.

From the FTP Server Parameters screen in the UNICON utility, you can configure the following parameters:

- **Maximum Number of Sessions.** This parameter determines the maximum number of users that can concurrently connect to the network through FTP Services for intraNetWare.
- **Maximum Session Length.** This parameter determines the maximum number of minutes a user can remain connected to the network before the server automatically disconnects this user's FTP session.
- **Idle Time Before FTP Server Unloads.** This parameter determines the number of minutes without any FTP activity that the server should wait before unloading FTP Services NLMs to conserve system resources.
- **Anonymous User Access.** This parameter indicates whether or not you allow anonymous users to connect to the network through FTP.
- **Default User's Home Directory.** This parameter specifies the default directory path for a user who does not have a home directory on the server.
- **Anonymous User's Home Directory.** This parameter specifies the default directory path for anonymous users.
- **Default Name Space.** This parameter specifies the name space used to present directory information to users. You can select DOS or NSF.
- **Intruder Detection.** This parameter indicates whether or not the server prevents a user from connecting to the network after several unsuccessful login attempts.
- **Number of Unsuccessful Attempts.** This parameter specifies the number of unsuccessful login attempts the server accepts from a user before preventing that user from accessing the network.
- **Detection Reset Interval.** This parameter specifies the number of minutes the server locks out a user who has triggered intruder detection.
- **Log Level.** This parameter determines what information is recorded in the FTP log file. If you enter NONE, the server does not log FTP sessions. If you enter LOGINS, the server records user logins. If you enter STATISTICS, the server records logins and the number of files users transfer to and from the network. If you enter FILE, the server records user logins, statistics, and details about every FTP transaction made during a user's FTP session.

Viewing FTP Session Statistics

You can view detailed FTP session statistics about each user connected to your company's network via FTP Services for intraNetWare. (See Figure 2.) To view these statistics, you complete the following steps:

1. Select the Manage Services options from the UNICON utility's main menu.
2. Select the FTP Server option, and then select the View Current FTP Statistics option.
3. A list of all active FTP sessions appears. To view detailed statistics about a particular FTP session, highlight that session, and press the Enter key.
4. The Detailed Session Statistics screen appears. (See Figure 2.) You can view the user's name (including NDS context), the user's IP address, the number of files the user has sent and received, the speed of the last file transfer, the total number of bytes transferred in this session, how long the user has been connected to the server, the user's current server and directory, and the last FTP command the user issued to the FTP server.

Deleting an Active FTP Session

Just as you can disconnect an intraNetWare client's connection to a server, you can disconnect an FTP client's connection to FTP Services for intraNetWare. To disconnect an FTP client's connection to FTP Services for intraNetWare, you complete the following steps:

1. Select the Manage Services option from the UNICON utility's main menu.
2. Select the FTP Server option, and then select the View Current FTP Statistics option.
3. A list of all active FTP sessions appears.

To disconnect a session, highlight that session, and press the Delete key.
4. A message appears, asking you to verify that you want to delete the session. Select Yes, and press the Enter key.

The UNICON utility does not immediately update the list of active FTP sessions. However, the number of active FTP sessions displayed at the bottom of the screen is reduced by one. To refresh the FTP session list, repeat step 1.

Restricting FTP Access

You can grant and deny FTP access to your company's network by editing the RESTRICT.FTP file. In this file, you can specify User, Group, or container objects and the level of access you want to grant these objects.

To edit the RESTRICT.FTP file, you complete the following steps:

1. Select the Manage Services option from the UNICON utility's main menu.
2. Select the FTP Server option, and then select the Restrict FTP Access option.
3. Edit the RESTRICT.FTP file as needed, and press the Escape key.
4. A message appears, asking if you want to save the changes you have made. Select Yes.

You can grant or deny FTP access to individual users and to groups of users. For example, you could deny FTP access to all users in the ACME container object while granting the ADMIN user access to establish an FTP connection. To do so, you would type the following lines in the RESTRICT.FTP file:

```
.ADMIN.O=ACME        ACCESS=ALLOW
*.O=ACME             ACCESS=DENY
```

You can also allow users to access only files on the server running FTP Services for intraNetWare, preventing users from accessing files on other intraNetWare servers. You can also grant access only if users request an FTP session from a workstation with a particular Internet host name or IP address. In addition, you can allow users to read files while restricting these users from writing files to your company's network. To learn how to format such FTP commands, you can read the instructions at the beginning of the RESTRICT.FTP file, or you can read the *Administrator's Guide* in the online documentation.

CONCLUSION

By installing and enabling FTP Services for intraNetWare, you provide users with another way to access files on your company's network. FTP Services for intraNetWare can be especially useful for users who work from home or travel frequently and need to upload files to or download files from the network. Because FTP Services for intraNetWare provides FTP services regardless of the server's or the client's platform, you can grant anyone with FTP client software access to files stored on an intraNetWare server.

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Laura Chappell

Service Location Protocol

Discovering Services in a Pure IP Environment

One of the most anticipated features of NetWare 5 is pure IP, the NetWare 5 architecture that provides NetWare Core Protocol (NCP) services over the TCP/IP stack natively (without any IPX header or services). Pure IP uses an array of IP-related protocols to provide these NCP services. For example, pure IP uses Service Location Protocol (SLP), a service discovery mechanism that allows NetWare 5 clients to locate servers and services that are Service Advertising Protocol (SAP) dependent during the bootup process.

This article explains when applications on NetWare 5 clients use SLP to locate services. This article also describes how SLP works and how devices that use SLP communicate.

WHEN DO APPLICATIONS ON NETWARE 5 CLIENTS USE SLP?

NetWare 5 provides several methods to discover services, including the following:

- **Novell Directory Services (NDS) Query.** The preferred method for an application to locate a service is through NDS, which provides authentication and security services for devices that can be registered as NDS objects.
- **Domain Naming System (DNS) Lookup.** An application that is not NDS aware can use DNS to locate a service.
- **Dynamic Host Configuration Protocol (DHCP) Query.** The NetWare 5 client software uses DHCP to locate an NDS tree and server when the client is configured to use DHCP services. DHCP offers three new options for obtaining NDS tree, server, and context information from a NetWare DHCP server daemon (the DHCP server processes running on a NetWare 5 server).
- **Lightweight Directory Access Protocol (LDAP) Lookup.** NetWare 5 provides LDAP support when an application specifically sends an LDAP query.
- **SLP Query.** NetWare 5 clients in a pure IP environment use SLP to discover the preferred NDS tree and server when the clients are not configured to use DHCP services. Although SLP can be used as a more fully functional mechanism to discover services, the best implementation is to use SLP only during the bootup process.

The application itself determines which discovery method to use. For example, an NCP-based application queries NDS directly to locate a service. However, another application could use an LDAP query to locate a service.

The NetWare 5 client software has two options for locating an NDS tree and server in a pure IP environment: DHCP or SLP. The NetWare 5 client software uses DHCP if you have configured the client to use DHCP services. For example, you can configure the client to obtain an IP address from a DHCP server. The NetWare 5 client software uses SLP if you have not configured the client to use DHCP services.

Note. In NetWare's IPX/SPX-based communications architecture, the NetWare client software issues a SAP broadcast (also known as a Get Nearest Server request) during the bootup process to locate services. When a NetWare 5 network is configured to support only pure IP, however, the NetWare 5 client software cannot use SAP to locate services. (Of course, losing SAP is not really a bad thing because devices that use SAP continually broadcast their services on the network.)

NetWare 5 includes a compatibility mode feature, which enables SLP to register services that are SAP dependent. When a service that relies upon service discovery is loaded on a NetWare 5 server, the server reroutes the SAP broadcast to SLP. The service can then be registered by a service agent or by a directory agent, and a user agent can locate this service. (These agents are shown in Figure 1 and are described in the next section.)

Illustration: Scott Pollack

SLP OVERVIEW

Defined in Request for Comments (RFC) 2165, SLP is a service discovery method for TCP/IP-based communications. SLP includes several processes. (See Figure 1.)

- User agents
- Service agents
- Directory agents
- Scopes

User Agents

A user agent initiates a discovery on behalf of an application. The NetWare 5 client software contains a user agent that is enabled by default and is launched during the bootup process. In a pure IP environment, SLP is the client software's preferred method to locate an NDS tree and server when this client software does not support DHCP.

Service Agents

A service agent works on behalf of a service to respond directly to a user agent's query for specific services. You can also configure a service agent to register the service with one or more directory agents. A user agent queries a service agent directly if no directory agent exists or if a directory agent does not respond to discovery queries.

Directory Agents

A directory agent collects and maintains information about service agents. A directory agent responds to a user agent's query only if the directory agent maintains information about the requested service.

If you use directory agents on a NetWare 5 network, the NetWare 5 client software queries the directory agent for service information during the bootup process. To configure a NetWare 5 server as a directory agent, you load an optional NetWare Loadable Module (NLM). However, you do not configure every server as a directory agent. You configure one local server as a directory agent, which provides service information for many other NetWare 5 servers.

Scopes

A scope can be thought of as a collection of services within a logical group. You might want to implement a scope for a very large installation to create a group of directory agents and services registered with these directory agents.

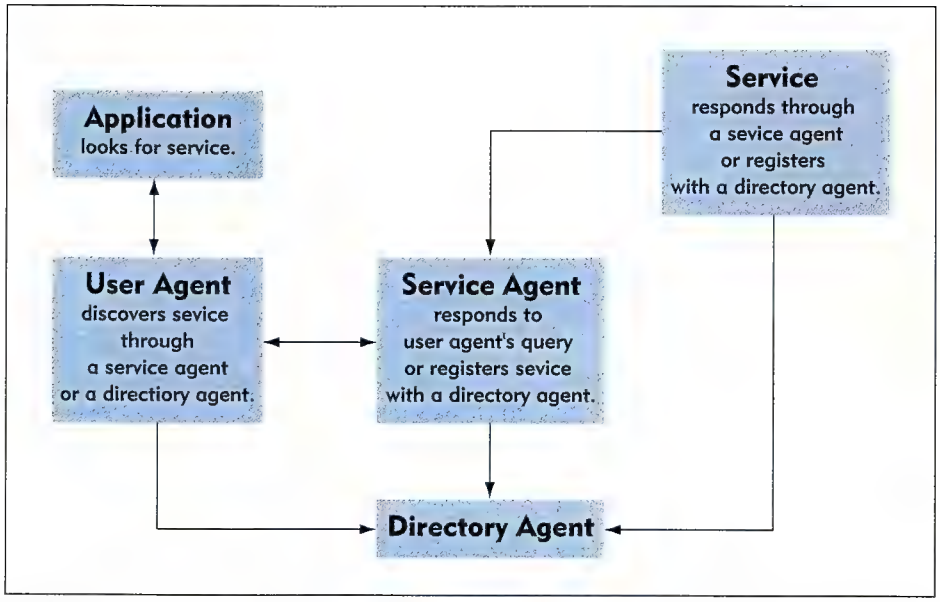

Figure 1. Applications can discover services through a service agent directly or through a directory agent.

SLP NETWORK DESIGN

You may not use every SLP process on your company's network. The processes you use depends on which SLP network design you choose. The SLP network design you choose, in turn, depends on the size and complexity of your company's network. Essentially, you determine the

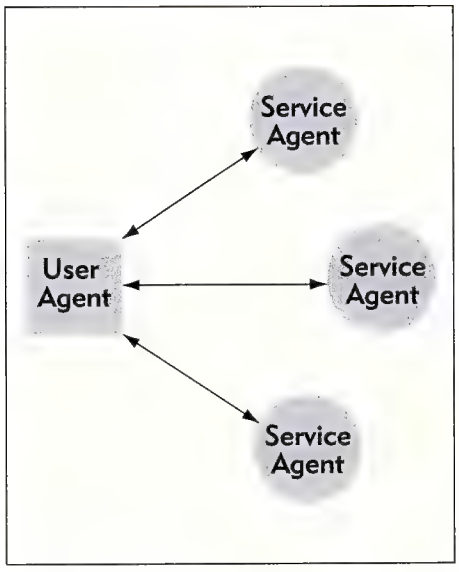

Figure 2. *By default, NetWare 5 uses the small service radius design.*

number of services running on the network, and you choose the best SLP network design to handle these services. You can choose one of the following SLP network designs:

- Small service radius
- Medium service radius
- Large service radius

Small Service Radius

You can use the small service radius design for an installation that supports 50 servers or less. In this design, user agents query service agents to locate services. (See Figure 2.) If you use a small service radius design on a NetWare 5 network, you simply keep the default settings for NetWare 5 and the NetWare 5 client software.

Medium Service Radius

In a large installation, however, you may not want hundreds of service agents replying to queries from user agents. In this case, you can load the directory agent on one NetWare server. When service agents for NetWare 5 servers discover that a directory agent is available, these service agents register with the directory agent. The directory agent then replies to queries from user agents. (See Figure 3.)

By default, the NetWare 5 client software can locate and use a directory agent if one exists on the NetWare 5 network. You do not have to reconfigure the NetWare 5 client software to use a directory agent.

Large Service Radius

You can use the large service radius design for a very large installation that has services spanning WAN links. In this design, you group services in scopes. For example, if your company had two offices—one in London and one in Paris—you could configure two scopes: a London scope and a Paris scope. (See Figure 4 on p. 36.) When a user in the London office requested a service, the request would indicate which scope contains the requested service. In this way, you would prevent SLP queries from being sent over a WAN link, which is typically a low-bandwidth, high-latency link that is not designed to handle excessive traffic.

You can also use the large service radius design to reduce the load on a particular directory agent: You separate services into scopes and set up a directory agent for each scope, ensuring that a single directory agent does not have to handle all SLP queries.

The large service radius design can become quite complex: You can assign several scopes to a particular directory agent, and you can assign several directory agents to one scope.

SLP COMMUNICATIONS

SLP communications can use User Datagram Protocol (UDP) or Transmission Control Protocol (TCP) with registered port 427. Although most SLP communications use UDP, TCP can be used for bulk information transfer—that is, traffic generated by a single request with multiple replies. (If you use an access filter or a security filter on routers or gateways, you must remove the filter on port 427 to enable SLP communications to work properly.)

SLP uses a combination of several types of communications:

- Directory agent discovery multicast packets (224.0.1.35)
- SLP general multicast packets (224.0.1.22)
- Internet Group Message Protocol (IGMP) multicast packets
- Unicast packets (station address)

Locating a Directory Agent

During the bootup process, an SLP device sends a directory agent discovery multicast packet, looking for a directory agent. If the service agent locates a directory agent, the service agent uses unicast packets to communicate with that directory agent. (I have been examining SLP communications on a network running the beta 3 version of NetWare 5. I have noticed an anomaly on Windows 95 workstations: They send an initial SLP broadcast during the bootup process. This anomaly should be fixed when NetWare 5 ships.)

If your company's network doesn't support multicast packets or DHCP services, broadcast communications or static configurations can be used to discover directory agents. For example, if your company has a large network, you

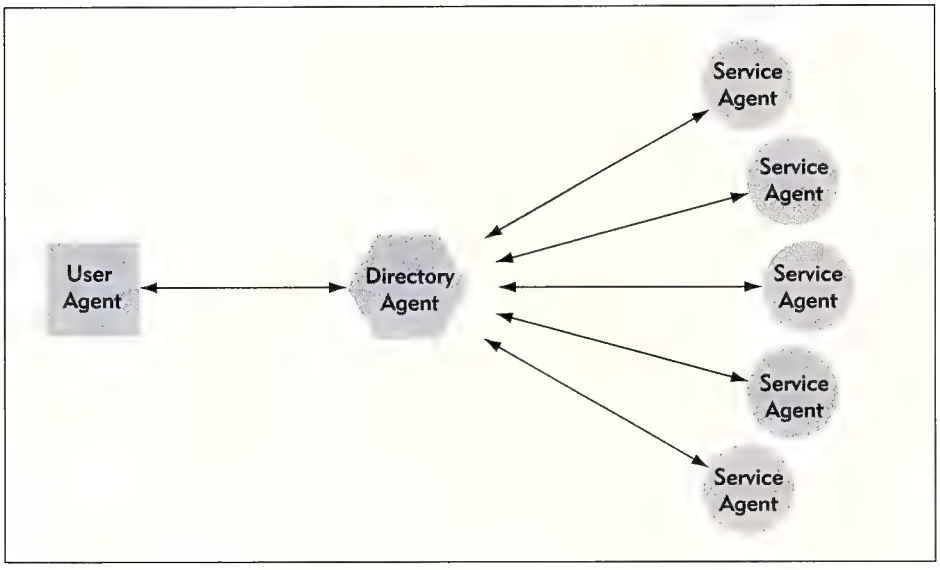

Figure 3. *Service agents register with a directory agent to reduce traffic on a large network.*

"GRASSHOPPER, SNATCH THE FLOPPY DISC FROM MY HAND."

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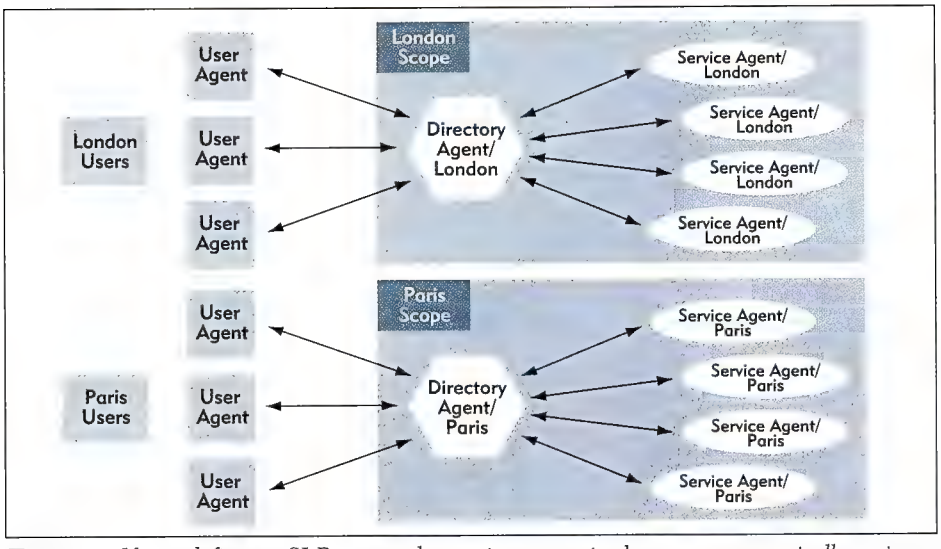

Figure 4. If you define an SLP scope, the service agents in the scope automatically register with the appropriate directory agent.

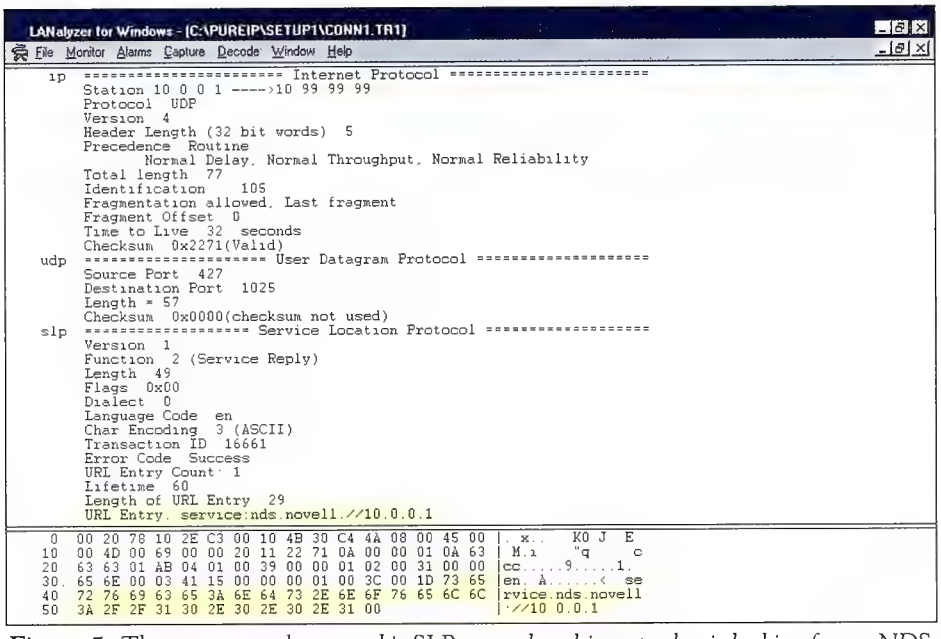

Figure 5. The user agent that sent this SLP general multicast packet is looking for an NDS tree called I2_TREE. (The beta 2 version of NetWare 5 uses the service type NDS.Novell, but the beta 3 version and the shipping version of NetWare 5 use NDAP.Novell.)

might have disabled multicast forwarding on routers to control traffic. In addition, you might have manually assigned IP addresses, eliminating the need for DHCP services.

Broadcast communications are, however, an undesirable way to implement SLP because a broadcast is considered a local operation and typically isn't allowed to propagate throughout an entire internetwork. As a result, using a broadcast reduces the radius in which services can be discovered to the local network only. A device cannot discover services on the other side of a router, unless the router forwards broadcast packets.

If no directory agent exists, the user agent sends an SLP general multicast packet to locate the requested service (rather than the directory agent). (See Figure 5.)

Joining a Multicast Group

SLP devices join a multicast group during the bootup process by sending an IGMP multicast packet on the network. Based on the IGMP multicast packets that IP routers receive from SLP devices, these routers decide whether or not to forward multicast packets to particular subnetworks. IP routers forward multicast packets only to subnetworks in which other devices have joined the multicast group. In this way, SLP uses multicast groups to reduce traffic.

SLP in Action on a NetWare 5 Network

To get a better idea of how SLP works, let's take a look at the NetWare 5 client software's bootup process. (This information is based on the beta 2 version of the NetWare 5 client software.) If the NetWare 5 client software is using SLP to discover services on a network

New Decodes for Novell's LANalyzer for Windows 2.2

If you use Novell's LANalyzer for Windows 2.2, you can download the latest decodes from ImagiTech Inc.'s World-Wide Web site. With this update, LANalyzer for Windows 2.2 can decode the following protocols:

- Service Location Protocol (SLP)
- Dynamic Host Configuration Protocol (DHCP), including the DHCP services that come with NetWare 5
- NetWare Core Protocol (NCP)/Transmission Control Protocol (TCP) (connection-oriented NCP over TCP/IP)
- NCP/User Datagram Protocol (UDP) (connectionless NCP over UDP/IP)
- Simple Mail Transfer Protocol (SMTP)

To update LANalyzer for Windows 2.2, you complete the following steps:

1. Download the LZFWIP.ZIP file from http://www.imagitech.com.
2. Decompress the LZFWIP.ZIP file, and then copy the .DLL files into the LZFW directory on your workstation's hard drive.
3. Copy the LZFW.INI file into the Windows directory on your workstation's hard drive. ●

that does not use directory agents or scopes, this client software completes the following bootup process:

1. The client software's user agent sends an SLP directory agent discovery multicast packet.
2. The client software's user agent sends an SLP general multicast packet for the migration gateway. (The migration gateway offers a gateway service between pure IP and pure IPX configurations on a NetWare 5 network.)
3. The client software's user agent sends an SLP general multicast packet to discover the preferred NDS tree and server. (See Figure 5.)
4. The client software's DHCP stack sends DHCP attempts. (These attempts were unanswered on my network because a DHCP daemon process is not running on the network.)
5. The service agent replies.

SERVICE TYPES

If you use a network analyzer, such as Novell's LANalyzer for Windows 2.2, to examine SLP communications, you will notice that SLP uses URLs to define resources. (See "New Decodes for Novell's LANalyzer for Windows 2.2.") This method of defining resources creates more flexible communications and naming mechanisms that take advantage of existing technology. For example, when a user agent sends an SLP query to find the preferred NDS tree and server, either a service agent or a directory agent replies with the following information:

```
service:ndap.novell:///l2_tree.
```

The IP address of the service provider (the NDS server, in this example) is located in the attributes of the reply.

Devices can also use SLP to discover other types of services, such as the following services:

- service:lpr:// (Line Printer service)
- service:http:// (HyperText Transfer Protocol)
- service:nfs:// (Network File System)

CONCLUSION

The NetWare 5 client software on most NetWare 5 networks that are configured to use pure IP will automatically discover services. If you must configure SLP for a large network, you should keep in mind that SLP is the bootup protocol that replaces SAP broadcasts. SLP is not a fully functioning naming and discovery protocol like NDS. SLP has definite limitations and should be considered a stepping stone for the NetWare 5 client software to attach to the network. After the NetWare 5 client software is attached to the network, NDS provides service discovery and registration information for all other network operations by default.

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Special thanks to Todd Rupper and Jim Erwin of Novell for their keen technical reviews and help in writing this article.

Backing Up Open GroupWise Database Files

Daniel G. Newell

Backing up critical data stored in GroupWise e-mail folders, calendars, and document repositories should be part of your company's daily backup routine. To create a restorable backup of all GroupWise database files, including open files, you must use one of the following methods:

- Use high-end backup software that directly supports the backup of open GroupWise database files (such as Computer Associates' ARCserve with Backup Agent for GroupWise or St. Bernard Software's Open File Manager).
- Completely unload all GroupWise agents so that all GroupWise database files are closed, and then back up your company's GroupWise domain and post offices using standard backup software. If GroupWise agents are active, GroupWise keeps several of its database files in a continually open state. Although you can configure some standard backup software to include open files, most backup software still cannot copy these files and retain the integrity of the GroupWise database. In many cases, the backup software simply returns an error message, even if you have selected the option to include open files.
- Use Novell's GWBACKUP and DBCOPY utilities to temporarily lock GroupWise database files and to create a snapshot of any open files. Then copy the snapshot to a backup device, such as a tape drive, later. (The GWBACKUP utility and the DBCOPY utility work with GroupWise 5.x.)

If you are not using one of these methods, the backup of your company's GroupWise database files may not be restorable. Having an unrestorable backup could result in a permanent loss of data if a natural disaster or a catastrophic failure affects your company's GroupWise domain or post offices.

Although the first and second methods allow you to create a restorable backup of GroupWise database files, purchasing high-end backup software may not be an option for your company, and unloading all GroupWise agents for at least two or three hours every night is an unattractive alternative. As a result, you may want to use the GWBACKUP utility and the DBCOPY utility instead. This article explains how both utilities work and how you can use these utilities to back up open GroupWise database files without having to unload GroupWise agents.

TWO UTILITIES FOR BACKING UP OPEN GROUPWISE DATABASE FILES

The GWBACKUP utility and the DBCOPY utility temporarily lock individual GroupWise database files to maintain their integrity and then copy these files to a separate directory. After the GroupWise database files have been copied to this directory, you can use standard backup software to archive these files.

Both the GWBACKUP utility and the DBCOPY utility allow you to back up entire GroupWise post offices. However, the DBCOPY utility also allows you to back up GroupWise domains. (A *domain* routes messages between post offices and provides gateways to external networks, such as the Internet. A *post office* stores messages for groups of users and routes messages between users in the same group.) In addition, the DBCOPY utility allows you to back up individual GroupWise database files in any GroupWise domain or post office by using a batch file.

The GWBACKUP utility offers an easy-to-use GUI that requires you to simply enter the source and destination directories. The DBCOPY utility, on the other hand, runs from the command line.

You can run both utilities from any Windows 95 workstation with Novell client software installed. To run the utilities successfully, you must be logged in to the network as a user with Read, Write, Create, and Delete rights to the source and destination directories for the backup. (The source directory contains the GroupWise domain or post office you want to back up. The destination directory, which you must create, can be located on any volume with enough available hard drive space to hold the backup.)

If you don't have the GWBACKUP utility and the DBCOPY utility, you can download the GWBUPAUS.EXE file free from Novell's Support Connection World-Wide Web site (http://support.novell.com/search/ff_index.htm). This file contains the GWBACKUP utility and its associated .DLL files, the DBCOPY utility, and two help files.

Backing Up GroupWise Post Offices

Your company's GroupWise database consists of one GroupWise domain and one or more GroupWise post offices. The GroupWise database is not, however, one large file. Rather, this database is a collection of administrative and database files that are organized in a complex directory structure. A GroupWise domain and individual GroupWise post offices reside in separate root directories and may be located on different servers.

The GWBACKUP utility offers the simplest method for backing up a GroupWise post office. This utility automatically copies the entire contents of the post office, including

Using Novell's GWBACKUP Utility

Before you run Novell's GWBACKUP utility, you must create a destination directory for the backup, either on the same volume that contains the GroupWise post office you want to back up or on another volume. Because the GWBACKUP utility cannot compress files or back up files directly to a backup device (such as a tape drive), you must ensure that the volume in which you create the destination directory contains an amount of available hard drive space greater than or equal to the size of the GroupWise post office you are backing up.

After you create the destination directory, you complete the following steps:

1. Run the GWBACKUP.EXE file on any Windows 95 workstation with Novell client software installed. A screen appears, prompting you to enter both the source directory of the GroupWise post office you want to back up and the destination directory for the backup.
2. Enter the source and destination directories.
3. Select the Run option. The GroupWise Post Office Backup dialog box appears, displaying the status of the backup process. This dialog box shows the number of files that have been copied and the name of the file that is currently being copied.

   Note. If the GWBACKUP utility fails to complete an operation due to a problem such as a missing file or an indefinitely locked database, an error message appears in a dialog box that gives you three options: Retry, Cancel, and Abort. If you select the Cancel option, the GWBACKUP utility skips the file that is causing the problem. You can then use Novell's DBCOPY utility to back up this file. (If the GWBACKUP utility encounters files that are temporarily locked due to user activity, this utility automatically retries backing up the files later.)

   However, Novell recommends that you correct the problem and run the GWBACKUP utility again to back up the entire GroupWise post office. Copying files in the correct sequence helps retain data integrity.
4. When the backup process is completed, a dialog box appears, displaying the message "Backup Complete."

As the GWBACKUP utility performs the backup process, users can continue to use GroupWise. During this process, the GWBACKUP utility creates a log file called BU.LOG, which is stored in the destination directory. You can refer to this log file for a transaction history of all operations, including operations that result in errors.

GroupWise, like most messaging systems, does not allow certain files and directories to be backed up effectively. For example, you cannot effectively back up the following directories in any GroupWise post office: WPCSIN, WPCSOUT, OFWORK, MSLOCAL, and LIBRARY. These directories serve as administrative inboxes and outboxes and temporary repositories. Files stored in these directories include messages and attachments that are pending delivery and temporary QuickFinder files. GroupWise does not allow you to back up these directories because the files stored in the directories are temporary. Once the files become part of the regular GroupWise database (when messages and attachments are delivered, for example), these files will be included in the next backup.

attachment files and GroupWise Document Management System (DMS) files, to the destination directory. The GWBACKUP utility does not give you the option of excluding any files during the backup process. (See "Using Novell's GWBACKUP Utility.")

The DBCOPY utility offers a more sophisticated method for backing up a GroupWise post office. By using a batch file with this utility, you can selectively copy portions of the GroupWise post office, including GroupWise database files, QuickFinder files, and user indexes. You can also decide whether you want to copy attachment files and DMS files.

Advantages of a DBCOPY Batch File

Although using the DBCOPY utility is more difficult to configure, this method offers significant advantages over using the GWBACKUP utility. For example, you can save a lot of hard drive space by configuring the DBCOPY batch file to skip attachment files and DMS files. These files are collectively known as binary large object (BLOB) files. (For more information about the types of files GroupWise uses, refer to the table contained in the GWBACKUP.HTM help file, which is included in the GWBUPAUS.EXE file mentioned earlier.)

In fact, BLOB files for a small workgroup of only eight users might require as much as 300 MB of hard drive space. Not only do these files use a significant amount of hard drive space, but they also require a significant amount of time and system resources to copy.

Fortunately, BLOB files are not kept in a continually open state, as are GroupWise database files, QuickFinder files, and user indexes. As a result, you can configure the DBCOPY batch file to exclude BLOB files from the snapshot, and you can back up these files directly to a tape drive using standard backup software instead.

The biggest advantage of using a DBCOPY batch file instead of the GWBACKUP utility is that you can automate the execution of this batch file by using a Windows 95 program scheduler. The GWBACKUP utility, on the other hand, requires you to manually enter the source and destination directories each time you run this utility.

Using a DBCOPY batch file, you can also automate the backup of the WPDOMAIN.DB file, which is the core GroupWise database file for your company's GroupWise domain. You do not need to back up the entire domain. Most of the domain serves merely as a repository for temporary data and does not need to be backed up.

USING A DBCOPY BATCH FILE

I recommend that you back up your company's GroupWise domain and post offices by completing the following steps:

1. Create a destination directory for the snapshot that will be created by a DBCOPY batch file.
2. Create and run a DBCOPY batch file. (See "Sample DBCOPY Batch File.")

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Sample DBCOPY Batch File

The following DBCOPY batch file is an example of the type of file you might use to back up a GroupWise domain and post office with Novell's DBCOPY utility:

```
@ECHO OFF
REM  Batch file to create snapshot images of open GroupWise
REM  database files so that GroupWise domains and post offices
REM  can be fully backed up using standard backup software.

DBCOPY /Y /Q \\<POSTOFFICE>\OFUSER\INDEX
   \\<PO_BKUP_DIR>\OFUSER\INDEX
DBCOPY /Y \\<POSTOFFICE>\OFUSER
   \\<PO_BKUP_DIR>\OFUSER
DBCOPY /Y \\<POSTOFFICE>\OFMSG
   \\<PO_BKUP_DIR>\OFMSG
REM  optional next command = backup blob files
REM  DBCOPY /Y /B \\<POSTOFFICE>\OFFILES
   \\<PO_BKUP_DIR>\OFFILES

DBCOPY /Y \\<POSTOFFICE>\GWDMS
   \\<PO_BKUP_DIR>\GWDMS
REM  Repeat the following three commands for each LIBxxxx
REM  directory under GWDMS
DBCOPY /Y /Q \\<POSTOFFICE>\GWDMS\LIB0001\INDEX
   \\<PO_BKUP_DIR>\GWDMS\LIB0001\INDEX
DBCOPY /Y \\<POSTOFFICE>\GWDMS\LIB0001
   \\<PO_BKUP_DIR>\GWDMS\LIB0001
REM  optional next command = backup DMS BLOB files
REM DBCOPY /Y /B \\<POSTOFFICE>\GWDMS\LIB0001\DOCS
   \\<PO_BKUP_DIR>\GWDMS\LIB0001\DOCS

DBCOPY /Y \\<POSTOFFICE> \\<PO_BKUP_DIR>
DBCOPY /Y \\<POSTOFFICE>\*.DC \\<PO_BKUP_DIR>
DBCOPY /Y /B \\<POSTOFFICE>\OFVIEWS
   \\<PO_BKUP_DIR>\OFVIEWS
DBCOPY /Y \\<DOMAIN> \\<DOMAIN_BKUP_DIR>

ECHO ON
REM  GroupWise Backup Complete—Check output for errors
@ECHO OFF
```

You can download a fully annotated version of this sample DBCOPY batch file from *NetWare Connection*'s World-Wide Web site at http://www.novell.com/nwc. (For more information about using a DBCOPY batch file, see the "Using a DBCOPY Batch File" section on p. 39.)

3. Configure standard backup software to exclude directories containing open GroupWise database files or temporary files that cannot be backed up effectively. Also configure this software to include the destination directory that contains the snapshot and any directories that contain BLOB files.

The following sections explain each of these steps:

Creating a Destination Directory

Before you create and run a DBCOPY batch file, you must create a destination directory for each GroupWise domain and post office you want to back up. You can create these directories on the same volume on which the GroupWise domain and post offices reside, or you can create these directories on another volume anywhere in the network. Because the DBCOPY utility cannot compress any of the files it copies, you must ensure that the amount of available hard drive space on this volume is greater than or equal to the size of the files you are backing up.

Within each destination directory, you must create a directory structure exactly like the one shown in Figure 1. If you are not using GroupWise DMS libraries, you can omit the GWDMS directory tree. If you are using GroupWise DMS libraries, you can create as many LIB*xxxx* subdirectories as necessary. (Replace LIB*xxxx* with the name of each subdirectory in the GWDMS directory of the GroupWise post office you want to back up.) When you run the DBCOPY batch file, the DBCOPY utility should automatically create all other required subdirectories. (These subdirectories are not shown in Figure 1.)

Creating and Running a DBCOPY Batch File

If possible, you should back up your company's GroupWise domain and post offices during minimum usage times. The fewer changes that users make to GroupWise database files during the backup process, the better the integrity of the backup will be. Keep in mind, however, that one of the main benefits of using the GWBACKUP utility and the DBCOPY utility is that you do not have to shut down GroupWise for the backup to be effective.

The DBCOPY batch file gives you a lot of flexibility in the way that you back up your company's GroupWise domain and post offices. For example, you could choose not to create a snapshot of BLOB files by excluding the commands that backup the OFFILES, OFVIEWS, and GWDMS\LIB*xxxx*\DOCS directories in each post office. As mentioned earlier, BLOB files, unlike other GroupWise database files, are not kept in a continually open state. As a result, you can use standard backup software to back up these files directly from their native location. To provide redundancy, however, you may want to create a snapshot of the BLOB files and store this snapshot on another server. In this case, you can easily include BLOB files in the DBCOPY batch file that you create.

A valuable feature of the DBCOPY utility is that it copies only GroupWise database files that are new to the destination directory or have been changed since the last backup was made. Running a DBCOPY batch file daily keeps the entire snapshot up-to-date, essentially providing a complete backup of all GroupWise database files on the server that contains the destination directory. You can then back up the snapshot on a tape drive using standard backup software.

Configuring Your Company's Standard Backup Software

Figure 2 shows the basic directory structure of a GroupWise domain and post office. (See p. 44.) The directories

shaded in yellow are administrative directories and temporary repositories for transient data and cannot be restored effectively. You should configure the backup software your company uses to exclude all of the directories shown in Figure 2 except those highlighted in green.

You should use a DBCOPY batch file to create a snapshot of the directories highlighted in blue in Figure 2. (See p. 44.) You can then configure the backup software to back up the destination directory containing the snapshot.

You should also configure the backup software to include the directories highlighted in green, which contain BLOB files. Because GroupWise does not keep BLOB files in a continually open state, you can back up these files directly from their native location. (For more information about how to back up particular directories, see "To Back Up or Not to Back Up.)

THE DBCOPY UTILITY'S PECULIAR PROPERTIES

Although you run the DBCOPY utility in the same way you run most command-line utilities, this utility has some peculiarities. For example, you cannot redirect the output of the DBCOPY utility to a file. Instead, one or more output windows appear on your Windows 95 desktop every time you run this utility. The name in the title bar of each output window changes to Inactive as soon as the DBCOPY utility completes its current session.

A DBCOPY batch file generates a new instance of the DBCOPY utility every time the batch file executes a DBCOPY command. As a result, you may have as many as 10 instances running at one time. For each instance, an output window appears on your Windows 95 desktop. You should not close any of these windows until the name in the title bar of every window has changed to Inactive. Unfortunately, the DBCOPY utility does not recover elegantly when you close a window prematurely; in most cases, you must reboot your workstation.

If you schedule a DBCOPY batch file to run at night or when you are away from your workstation, you will probably find your Windows 95 desktop covered with output windows when you return. You should scan the text in these windows for error messages.

If you find an error message in a particular window, you can copy the text in this window by using the pull-down menu that appears when you click the

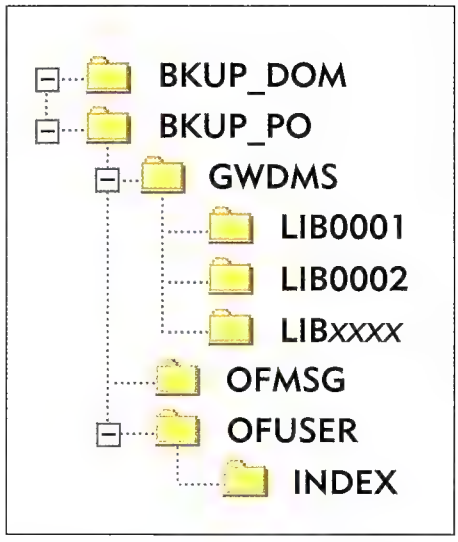

Figure 1. You must use this directory structure when backing up GroupWise domains and post offices with the DBCOPY utility.

To Back Up or Not to Back Up

Before you back up your company's GroupWise domain and post offices, you should be aware that not all GroupWise directories are created equal: Some directories should be backed up directly from their native location, some directories should be backed up as a snapshot, and some directories should not be backed up at all.

BACK UP DIRECTLY FROM NATIVE LOCATION

You can include the following directories in your company's daily backup routine, and you can back up these directories directly from their native location:

- <POSTOFFICE>\OFFILES
- <POSTOFFICE>\OFVIEWS
- <POSTOFFICE>\GWDMS/LIBxxxx/DOCS
- <POSTOFFICE>\GWDMS/LIBxxxx/ARCHIVE
- <POSTOFFICE>\LIBRARY

BACK UP AS A SNAPSHOT

You can also include the following directories in your company's daily backup routine:

- <PO_BCKUP_DIR>\[ROOT]
- <PO_BCKUP_DIR>\OFMSG
- <PO_BCKUP_DIR>\OFUSER
- <PO_BCKUP_DIR>\GWDMS
- <PO_BCKUP_DIR>\GWDMS/LIBxxx
- <PO_BCKUP_DIR>\GWDMS/LIBxxx/INDEX

However, you should not back up these directories directly from their native location. Rather, you should first create a snapshot of the directories using a DBCOPY batch file. (See the "Using a DBCOPY Batch File" section on p. 39 in the main article.) You can then back up the snapshot.

Although you can use either the GWBACKUP utility or the DBCOPY utility to create a snapshot, the DBCOPY utility allows you to use a DBCOPY batch file to exclude binary large object (BLOB) files from the snapshot. Then you can simply back up BLOB files directly from their native location. (For more information about BLOB files, see the "Creating and Running a DBCOPY Batch File" on p. 42.)

DO NOT BACK UP

You should exclude the following directories from your company's daily backup routine. You should not back up these directories because they are administrative directories that contain transitory data. As a result, these directories cannot be restored effectively.

- <POSTOFFICE>\WPCSIN
- <POSTOFFICE>\WPCSOUT
- <POSTOFFICE>\OFWORK
- <POSTOFFICE>\MSLOCAL
- <DOMAIN>

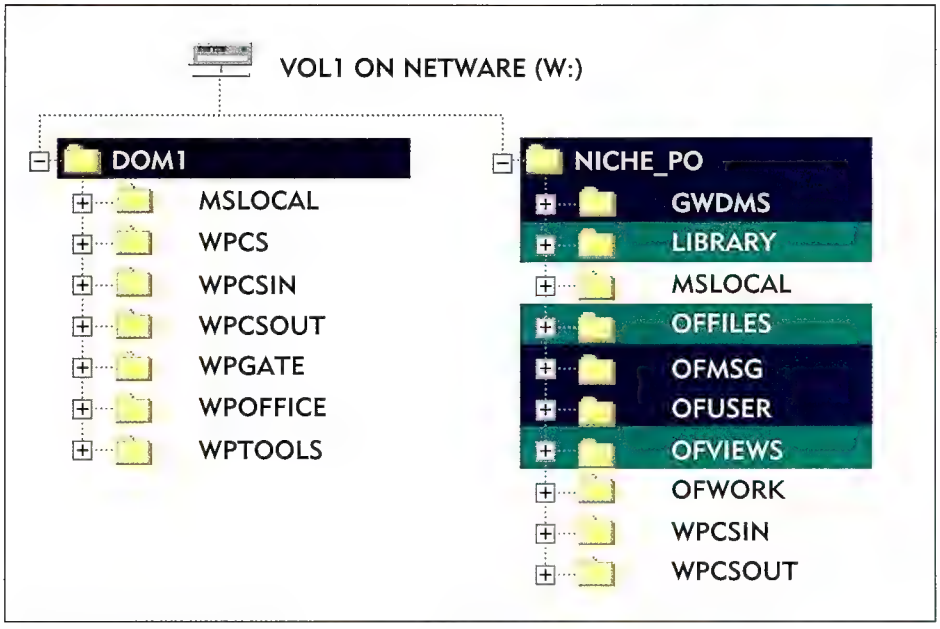

Figure 2. You should configure your company's backup software to exclude all of these GroupWise directories except those highlighted in green. You can then use the DBCOPY utility to create of snapshot of the directories highlighted in blue.

icon in the upper left-hand corner of the window's title bar. You can then paste the text into a file in any Windows-based text editor, such as the Windows 95 Notepad utility.

Finally, the DBCOPY utility's documentation, which is included in the GWBUPAUS.EXE file mentioned earlier, is not entirely accurate. For example, if you find discrepancies between the documentation and the information contained in this article, you should consider this article to be a more reliable source. The help files included in the GWBUPAUS.EXE file may also be misleading. (You can access the DBCOPY help files by using the /? and /B switches in the DBCOPY utility.)

POTENTIAL PROBLEMS YOU MAY ENCOUNTER

You may encounter the following problems when you use the DBCOPY utility:

First, a DBCOPY batch file can fail if a GroupWise database file remains locked indefinitely. Indefinite file locks are commonly caused by a workstation that has hung at the same time the workstation locked the GroupWise database file. To overcome this problem, you can usually just restart the workstation that has hung and then rerun the DBCOPY batch file. In some cases, however, you may have to restart GroupWise.

Second, if you back up BLOB files before the user databases and indexes, you risk compromising the integrity of the database. If users send or receive any messages with attachments (BLOB files), either during or immediately after you back up the BLOB files, the backup of the user databases and indexes may include references to BLOB files that are not backed up. If you restore the backup, users may receive errors and will not be able to open some of their messages.

You can avoid this problem by backing up the user databases and indexes first and the BLOB files second. Of course, because extra BLOB files could possibly be added in between the time you back up the user databases and indexes and the time you back up the BLOB files, you may back up more BLOB files than there are references for in the user databases and indexes. However, this occurrence will not cause any application errors, and you will be sure that all messages in the user databases and indexes have all of their associated attachments.

RESTORING GROUPWISE DOMAINS AND POST OFFICES

To restore GroupWise domains and post offices, you use the DBCOPY utility in virtually the same way that you use this utility to create a snapshot. To restore a GroupWise domain or post office, you simply use the native domain or post office directory as the destination directory and the location of the backup as the source directory for all DBCOPY commands.

When you restore a GroupWise post office, you should ensure that users are not using GroupWise, if only because all of their current work may be lost once older GroupWise database files are restored. (Keep in mind that you cannot either backup or restore individual message or attachment files.)

After you restore a GroupWise domain or post office, you should analyze the restored GroupWise database files by completing the following steps:

1. Launch Novell's NetWare Administrator (NWADMIN) utility from any Windows NT or Windows 95 workstation running this utility and the GroupWise snap-in module.
2. From the GroupWise view, select the post office you have restored.
3. From the Tools pull-down menu, select the GroupWise Utilities option, and then select the Mailbox/Library Maintenance option.
4. Finally, select the Analyze/Fix Databases option. This option then triggers an analysis of the restored GroupWise database files to help ensure the integrity of these files. (If you want the NWADMIN utility to fix any problems it finds with the GroupWise database files, you should also click the Fix Problems box.)

CONCLUSION

As with most administrative tasks, changing your company's daily backup routine to ensure that you have a restorable backup of GroupWise database files, requires an initial investment of time. Investing this time will, however, generate results by increasing the integrity of your company's overall backup strategy so that if a natural disaster or a catastrophic failure does occur, data loss will remain at a minimum.

To ensure that the Practical Networking column meets your needs, we need to know what you want to learn about. Please send your suggestions to practical@niche-associates.com.

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Novell Connecting Points

Keeping You Connected at InterConnect '98

Mickey Applebaum

This year, NetWare Users International, North America (NUI, NA) introduced InterConnect '98, a new generation of conferences designed to help networking professionals access data any time, any place, and across any platform. To help fulfill this goal, each InterConnect '98 conference features Novell Connecting Points (NCP), a network that provides attendees with individual GroupWise 5.2 accounts. Using these accounts, attendees can exchange e-mail messages with other attendees or with anyone who has an e-mail address.

If you have recently attended BrainShare, COMDEX, or NetWorld+Interop, you are probably familiar with NCP. At COMDEX/Fall '97, for example, Novell set up NCP to provide network access to more than 250,000 attendees. (For more information about NCP at COMDEX, see "COMDEX Intranet—Novell Connecting Points: Mission Impossible?" *NetWare Connection*, Dec. 1997/Jan. 1998, pp. 24–32. You can download this article from http://www.novell.com/nwc/dec.97-jan.98/ncpcomd7.)

Whether NCP is set up at COMDEX or at InterConnect '98, this network provides users with the same basic services:

- Users can access their own GroupWise 5.2 universal mailbox, which allows them to send and receive e-mail messages and to schedule appointments.
- Users can browse the Internet using the latest version of Netscape Navigator.
- Users can view NCP's Novell Directory Services (NDS) tree.

Although NCP is fast and easy to use, designing NCP for InterConnect '98 was neither a fast nor an easy process. Because InterConnect '98 is a series of conferences held across the United States and Canada, NUI, NA encountered several obstacles in delivering this world-class network at each InterConnect '98 conference.

DECISIONS, DECISIONS

NUI, NA's first challenge was deciding how to connect NCP to the Internet. NUI, NA wanted to implement a high-speed Internet connection so that many users could access the Internet simultaneously. In addition to being fast, however, the Internet connection had to be portable: NUI, NA had to be able to implement this connection for each InterConnect '98 conference and then quickly disassemble the connection and move to the next conference. NUI, NA decided to connect NCP to the Internet by using an Integrated Services Digital Network (ISDN) connection, which provides sufficient bandwidth for InterConnect '98 conferences and is portable.

With this decision made, NUI, NA faced the next obstacle: Since InterConnect '98 conferences are held in many cities, which Internet service provider (ISP) should provide the ISDN connection in each city? With help from Novell, multiple ISPs, and local telephone companies, NUI, NA uses an ISDN router to establish a direct, dial-in ISDN connection between NCP and Novell. NUI, NA then used Novell's Internet connection.

To simplify the task of transporting NCP from one InterConnect '98 conference to another, NUI, NA chose Compaq's Armada laptop computers as NCP clients. Using Novell Application Launcher (NAL) 2.0 and Z.E.N.works, NUI, NA set up one NCP client by configuring the client software, defining the client interface, and assigning applications to the client. (NAL 2.0 is available as a separate product and is actually part of Z.E.N.works.) NUI, NA then copied a master image of the NCP client's configuration to the NCP server. In this way, NUI, NA ensures that each NCP client has exactly the same configuration.

An essential application on NCP is Netscape Navigator, which allows conference attendees to access e-mail services and the Internet. Novell used Z.E.N.works to configure Netscape Navigator so that it automatically launches GroupWise WebAccess. Z.E.N.works also automatically forwards an attendees's login information to the GroupWise WebAccess login page. As a result, the attendee enters his or her login name and password only once to access both NCP and GroupWise WebAccess.

Now that NUI, NA has configured Netscape Navigator in this way, NUI, NA uses NAL 2.0 to distribute Netscape Navigator to every NCP client at each InterConnect '98 conference. NUI, NA also uses NAL 2.0 to distribute Corel WordPerfect to every NCP client.

DESIGNING NCP

One of NUI, NA's main concerns was how to design NCP to meet the changing needs of each InterConnect '98 conference. As a result, NUI, NA changed the design of NCP several times to make the network more efficient and scalable. Originally, NCP consisted of two Compaq Prosignia 200 servers and 10 Compaq Armada laptop computers, which were

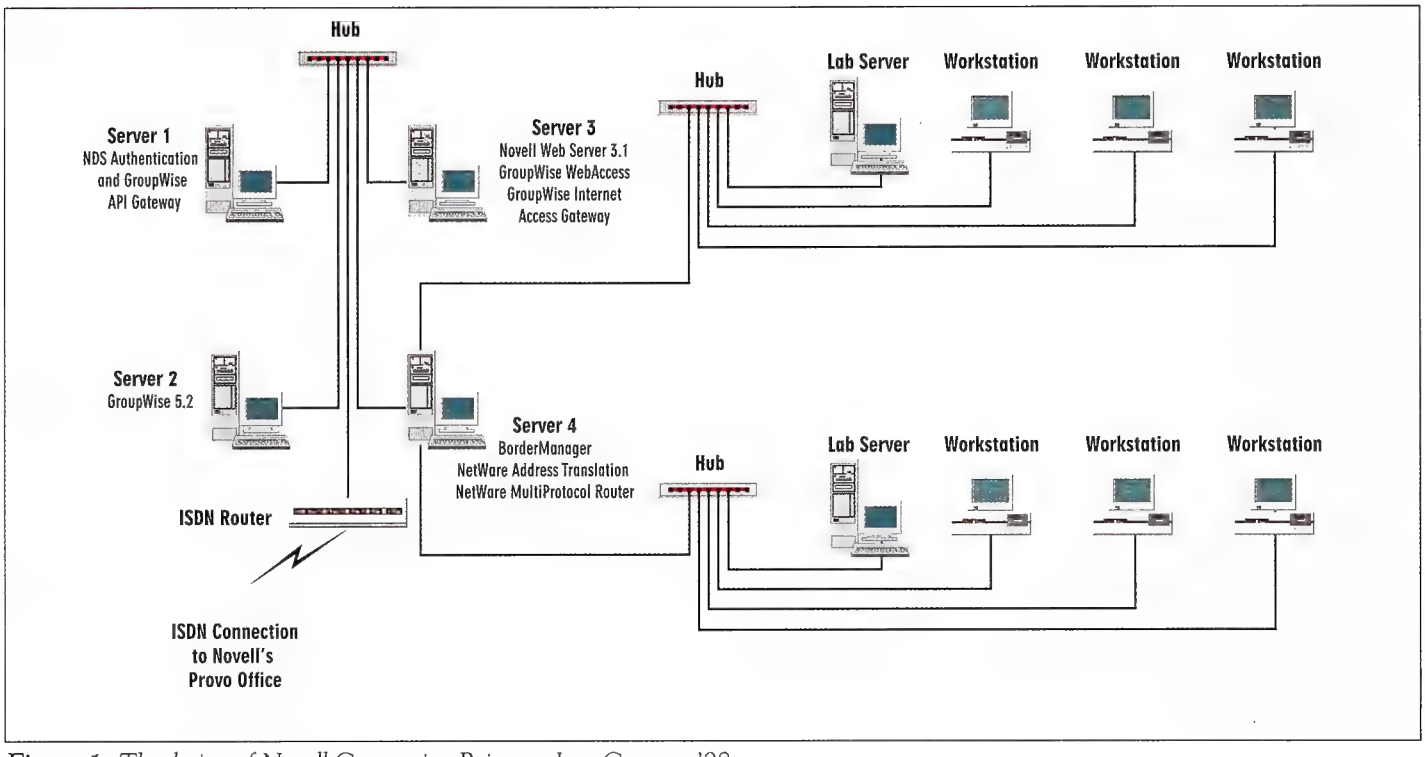

Figure 1. The design of Novell Connecting Points at InterConnect '98

connected to the NCP servers using a 16-port switch. The NCP servers performed separate duties: One server provided NDS authentication services, and the other server provided GroupWise 5.2 services, including GroupWise WebAccess.

NUI, NA quickly found that this configuration presented several problems: For example, the configuration limited the types of clients that could be added to the network—a significant problem since many NetWare user groups and vendors participating in InterConnect '98 want to present hands-on demonstrations of their products and services through NCP.

To increase the number of services available to NCP clients, NUI, NA added two hands-on demonstration labs to NCP. Each lab consists of a secondary NCP server and three NCP clients. To support these additional NCP servers and clients, NUI, NA added several Ethernet hubs to NCP.

Another problem with the original configuration of NCP was that each NCP client required a separate IP address to access the Internet. To limit the number of IP addresses needed, NUI, NA implemented NetWare Address Translation (NAT) and installed multiple network interface boards on one of the NCP servers. These changes allowed NUI, NA to organize NCP into a public segment (consisting of the primary NCP servers and the ISDN router) and two private segments (one segment consisting of NCP clients and another segment consisting of NCP servers and clients for the hands-on demonstration labs).

However, these changes also created some problems, making network security and fault tolerance pressing concerns. For example, if either of the two primary servers failed, the entire NCP network would fail. As a result, NUI, NA increased the number of primary servers from two to four and connected these servers and the ISDN router with an Allied Telesyn 8-port mini-hub.

In this configuration, the four primary servers perform the following functions. (See Figure 1.)

- Server one acts as the NDS authentication server and runs the GroupWise API Gateway, which allows NUI, NA to quickly import large numbers of usernames into the network. In addition, this server contains the GroupWise 5.2 domain and post office directories.
- Server two is the GroupWise server: It runs the GroupWise post office agents (POAs), message transfer agents (MTAs), and administration agents (ADAs).
- Server three runs Novell Web Server 3.1, GroupWise WebAccess, and GroupWise Internet Access Gateway.
- Server four runs NAT, NetWare MultiProtocol Router (MPR), and BorderManager, which provides proxy cache services. This server also provides IP-IP proxy services, which allow NCP to support two private IP segments and one public IP segment. To connect the private and public IP segments to one another, this server includes three network interface boards.

ON THE ROAD AGAIN

With NCP, you can remain on the job even when you are attending an InterConnect '98 conference. By providing fully functional e-mail services and Internet access, NCP allows you to access the data you need better than ever before.

For more information about InterConnect '98 conferences, visit NUI, NA's World-Wide Web site (http://www.novell.com/nui/conf). You can also call 1-800-228-4684 or 1-801-228-4500.

Mickey Applebaum has worked with NetWare for 14 years. Mickey currently provides technical support on the Internet for The Tech Forums Inc. (http://theforums.com). You can reach Mickey at mickey@homein.salt-lake-city.ut.us.

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Let Your Browser Do the Walking

Matthew Jones

If you are looking for a product or a service provided by a company in your city, you can always refer to your local telephone company's yellow pages. But what if you are looking for a product or a service provided by a company in another city, state, or country? If you visit the World-Wide Web sites mentioned in this article, you can find online yellow pages listing companies throughout the world. After you have located the information you need, you can check out this month's network resources and games. You can then read about the new products I have found. (See "Product Snapshots.")

WORLD-WIDE WEB SITES

BigBook (http://www.bigbook.com), which is hosted by GTE, provides a combination of online yellow pages and online white pages for an extensive array of companies. As with hard-copy yellow pages, you can search the BigBook database by category. You can either enter a keyword or choose from a list of predefined categories, such as accountants, government offices, and software. As with hard-copy white pages, you can also search the BigBook database by company name. You can even specify that you want to view listings only within a certain distance from the location you enter.

While you are searching the BigBook database, you might want to ensure that your company is listed in this database. If you don't find a listing for your company, you can submit this listing to the BigBook database for free. And because BigBook links to a site containing online classified ads, you can submit a free classified ad as well, and you can view classified ads submitted by other users.

BigBook also allows you to access GTE's Shop Online service, which provides links to online retailers from Barnes and Noble to PC Flowers. In addition, you can access other GTE resources, including a search engine that allows you to search for a particular company's web site and a consumer guide that offers reviews, specifications, and comparisons for many types of products, such as home electronics and office equipment.

Like BigBook, Zip2 (http://yp.zip2.com) provides online yellow pages—and a lot more. You can find the information you need by browsing a list of predefined categories, or you can enter a company name or a company type. To narrow your search, you can specify whether you want to receive a list of companies that are located near you or in another city or state.

After you find a company that interests you, you can use Zip2 to get directions to the company or to view a map of the city in which this company is located. You can even use Zip2 to search for a particular person's telephone number, mailing address, or e-mail address.

In addition, you can take advantage of Zip2's City Guide, which offers a variety of local resources. For example, you can view a list of upcoming events in your area, search a database of homes for sale, and read restaurant reviews.

NETWORK RESOURCES

You should visit the Novell Consulting Toolkit Online, which has been completely redesigned and updated (http://www.novell.com/programs/ncs/toolkit/iw_tools.html). The Novell Consulting Toolkit Online features a variety of freeware utilities developed by either Novell Consulting or Novell Technical Services to address customers' networking issues. For example, you can download an automated server installation utility that allows you to automatically install and configure multiple NetWare servers simultaneously. You can also download migration tools and third-party utilities.

NETWORK GAME OF THE MONTH

Battlezone from Activision Inc. is a strategy game that is based on a fictional event. The game begins in 1952, when a meteorite strikes Earth and lands in the Bering Straight. As scientists from the United States and the Soviet Union examine the debris, they discover a biometal that is ideal for building new types of vehicles and weapons. Unfortunately, only a limited amount of this biometal exists—not enough to meet the needs of both countries. Now the United States and the Soviet Union are engaged in a war over the remaining biometal, which exists on the moon and on other planets in the solar system.

After you decide whether to fight for the United States or the Soviet Union, your mission is to collect the biometal before the opposing country does. You must establish a base camp, mine the biometal, and deploy troops to prevent the opposing country from destroying the base camp. To accomplish these goals, you can build several types of buildings, such as recycling centers that process biometal, and you can use several types of vehicles, such as antigravity tanks that operate in the zero-gravity environment of space.

You can play Battlezone with up to seven other people over a modem, network, or Internet connection. Because Battlezone features a rendering engine that incorporates actual images from space expeditions, the 3-D graphics are fantastic.

You can purchase Battlezone through retail channels at the suggested retail price of U.S. $49.95, and you can download a demo version from http://www4.activision.com/games/battlezone/downloads.html. For more information about Battlezone, visit Activision's web site (http://www.activision.com). You can also call 1-310-255-2000.

Product Snapshots

When I am looking for the latest computer games, I often find new and interesting products. Product Snapshots gives you a quick overview of the most useful products I have found during the last month. (Please note that these are first-look reviews; I have not conducted exhaustive testing.)

AVATAR SHARK 250

Avatar Shark 250 from Avatar Peripherals Inc. is a removable storage device that can store up to 250 MB of data on each HARDiskette (the proprietary storage medium that works with Avatar Shark 250), while offering an average data-transfer rate of 1.25 Mbit/s. Although Avatar Shark 250 can store a lot of data, the device itself is actually compact enough to fit in a shirt pocket, and the HARDiskettes are smaller than floppy diskettes. As a result, Avatar Shark 250 is an ideal portable solution: You can even leave your bulky laptop at home and simply carry Avatar Shark 250 and a few HARDiskettes to and from your office.

Avatar Shark 250 is also an ideal portable solution because the hardware drivers that come with Avatar Shark 250 allow you to quickly disconnect the device without having to shut down your PC. In addition, Avatar Shark 250 includes a unique combination cable that both connects Avatar Shark 250 to your PC's parallel port and pulls power from your PC's keyboard port. This combination cable eliminates the need for separate peripheral connection cables and power adapters.

The only drawback to Avatar Shark 250 is that you cannot leave any HARDiskettes in the device when you move it from one PC to another; you could ruin the drive heads if you don't eject the HARDiskette first. Otherwise, both Avatar Shark 250 and the HARDiskettes are pretty tough. For example, all of the HARDiskettes are enclosed in a sturdy rubber case, which protects them from the rough treatment that most portable solutions receive.

Avatar Shark 250 includes one free HARDiskette that contains all of the necessary hardware drivers. Avatar Shark 250 also includes the following third-party products:

- **PCCrypto from Network Associates Inc.** This product allows you to encrypt files as you store them on Avatar Shark 250.
- **WebScan from Network Associates Inc.** This product allows you to detect malicious Java and ActiveX programs that run on the World-Wide Web sites you visit.
- **HotPagePlus from DocuMagix Inc.** This product allows you to capture and organize any interesting information that you find on the web sites you visit.
- **NovaDisk Lite Backup from NovaStor Corp.** This product allows you to use Avatar Shark 250 as a backup device.

You can purchase Avatar Shark 250 through retail channels at the suggested retail price of U.S. $249, and you can purchase additional HARDiskettes at the suggested retail price of U.S. $39 each. For more information about Avatar Shark 250, visit Avatar Peripherals' web site (http://www.goavatar.com). You can also call 1-888-462-8282 or 1-408-321-0110.

SNAPBACK LIVE!

SnapBack Live! from Columbia Data Products Inc. is a software-based backup and restore utility that simplifies the backup and disaster recovery processes. With SnapBack Live!, you can make an exact, byte-by-byte image of the hard drive on any intraNetWare, NetWare 4, or NetWare 3 server, and you can copy this image to a SCSI tape drive attached to the server.

If a disaster occurs, you simply insert the backup tape into the tape drive, and you insert the recovery diskette, which comes with SnapBack Live!, into the floppy diskette drive. You then enter a single keystroke, thus restoring the server and all of its volumes to the state they were in before the disaster occurred. Because SnapBack Live! creates a byte-by-byte image, you do not need to reformat the hard drive, reinstall the operating system and applications, or reconfigure the hardware and software. As a result, users can immediately access the server again.

Not only is SnapBack Live! easy to use, but it is also easy to manage. You can enter backup and restore commands directly at the server console, or you can use the Windows-based management program that comes with SnapBack Live! With this management program, which runs on the server, you can schedule the backup process, and you can check the status of this process. SnapBack Live! also includes the TD-ROM utility, which allows you to mount the byte-by-byte image on a backup tape as a read-only volume on the server. With this read-only volume, you can then recover data or restore lost files.

You can purchase SnapBack Live! through retail channels at the suggested retail price of U.S. $595. For more information about SnapBack Live!, visit Columbia Data Products' web site (http://www.cdp.com). You can also call 1-800-613-6288 or 1-407-869-6700.

STANDALONE GAME OF THE MONTH

Jazz Jackrabbit 2 from Epic MegaGames Inc. is the long-awaited sequel to Jazz Jackrabbit, an award-winning family game suitable for both children and adults. If you are tired of shoot-'em-up games like Battlezone, Jazz Jackrabbit 2 might be just what you are looking for.

Jazz Jackrabbit, which was released in 1994, is a traditional side-scroller game with stunning graphics and smooth game play. Jazz Jackrabbit 2, however, improves on the original: In Jazz Jackrabbit 2, you encounter various puzzles at each level. When you solve a particular puzzle, the level dynamically changes, allowing you to see different portions of this level. In fact, each level can rearrange itself on the fly, which means that portions of a particular level can appear or disappear right before your eyes.

The appearance of each level also depends on which character you choose to control: Jazz or Spaz. If you choose to control Jazz, you may start at a different point in a particular level than if you were controlling Spaz. In addition, these characters have unique capabilities. For example, Jazz excels at jumping long distances, while Spaz excels at jumping high into the air.

You can purchase Jazz Jackrabbit through retail channels at the suggested retail price of U.S. $34.95, and you can download a shareware version from http://www.jazzjackrabbit.com/downloads.htm. For more information about Jazz Jackrabbit 2, visit Epic MegaGames' web site (http://www.epicgames.com).

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NEW!

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Eric Harper and
David L. Gardner
408pp
Retail Price: $34.99
Our Price: $27.99
ISBN: 45043
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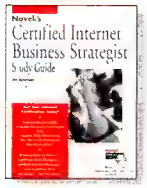

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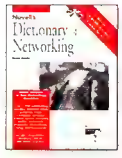

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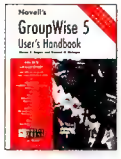

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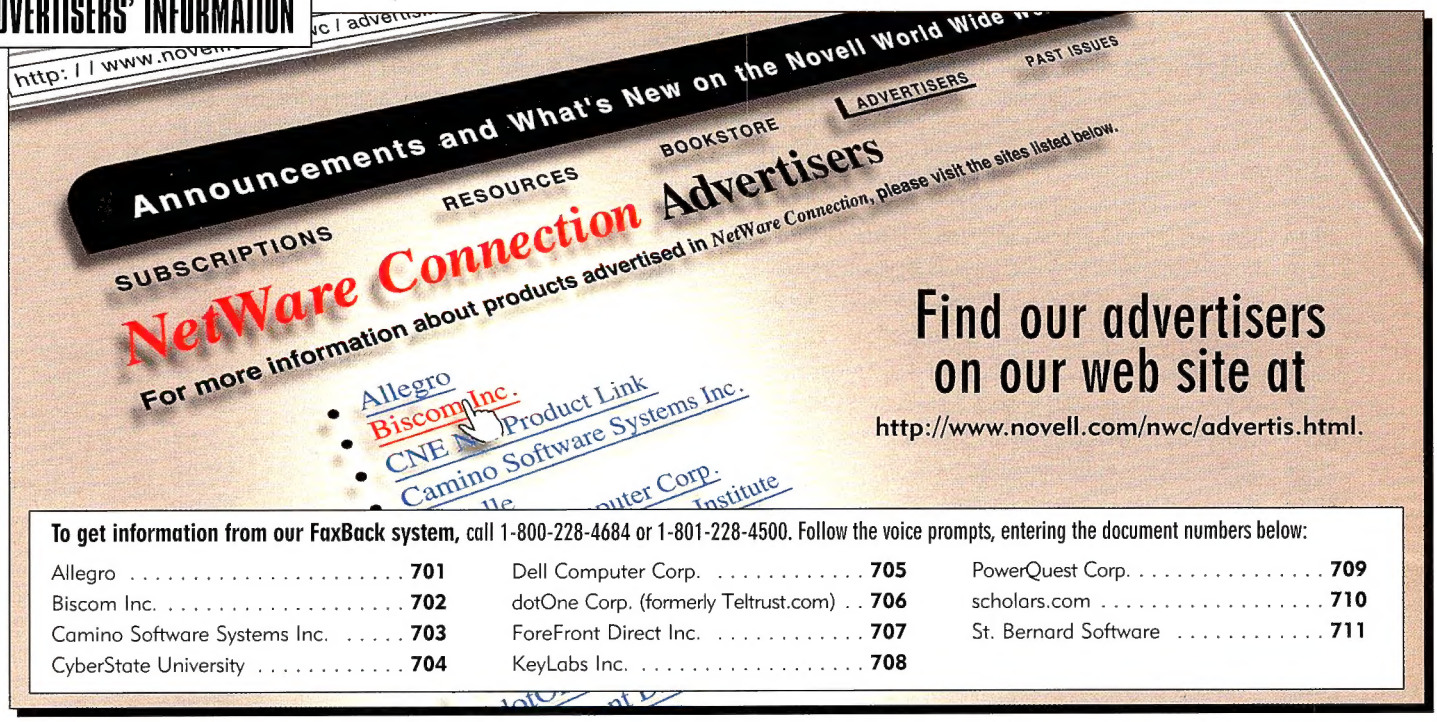

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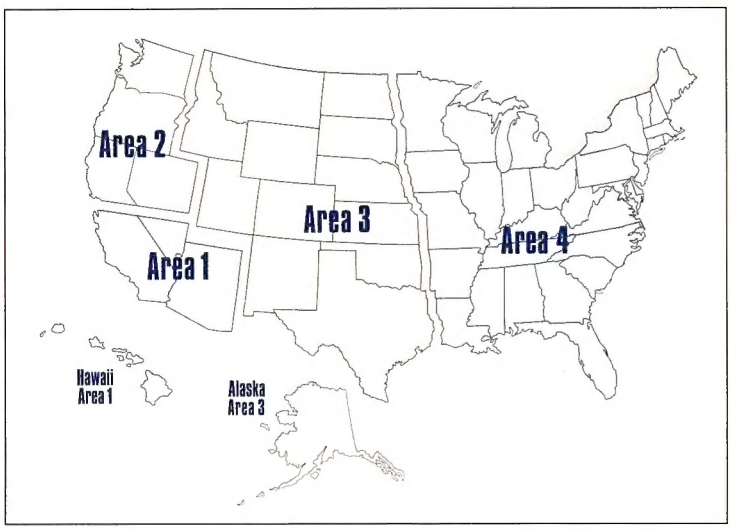

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